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MODERN MECHANICS AND INVENTIONS

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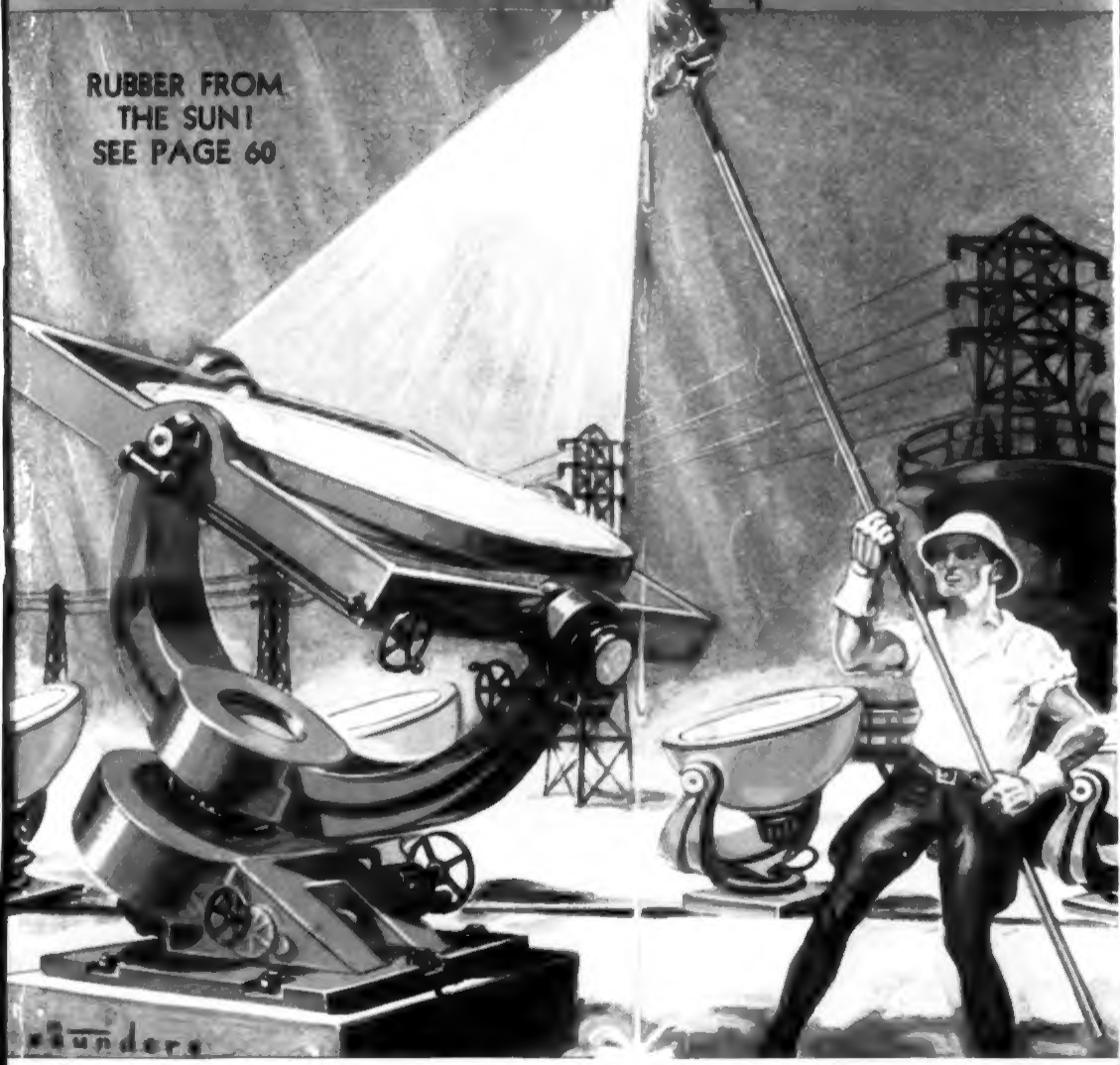

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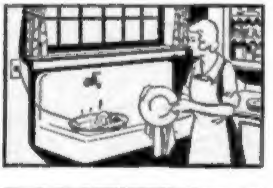

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VOLUME VIII
NUMBER 1

May, 1932

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Published monthly by Fawcett Publications, Inc., at 501 7th Ave. So., Minneapolis, Minnesota. MODERN MECHANICS AND INVENTIONS entered as second class matter September 20th, 1928, at the Post Office, Minneapolis, Minnesota, under the act of March 3rd, 1879. W. H. Fawcett, Publisher; Roscoe Fawcett, General Manager; Jack Smalley, Managing Editor. Copyright 1932. Advertising Offices: Chicago office, 35 East Wacker Drive (Phone State 2855); New York office, 52 Vanderbilt Avenue, Room 1003 (Phone Murray Hill 2-1555). All manuscripts should be addressed to our editorial office at 529 So. 7th Street, Minneapolis, Minn. Manuscripts will not be returned unless accompanied by return postage. Advertising forms close on the 20th of the third preceding month. Price 25 cents a copy; $2.50 a year in the United States and possessions. In Canada, 30c per copy, per year $3.50. Other Postal Unions, $3.00 per year. Printed in U.S.A.

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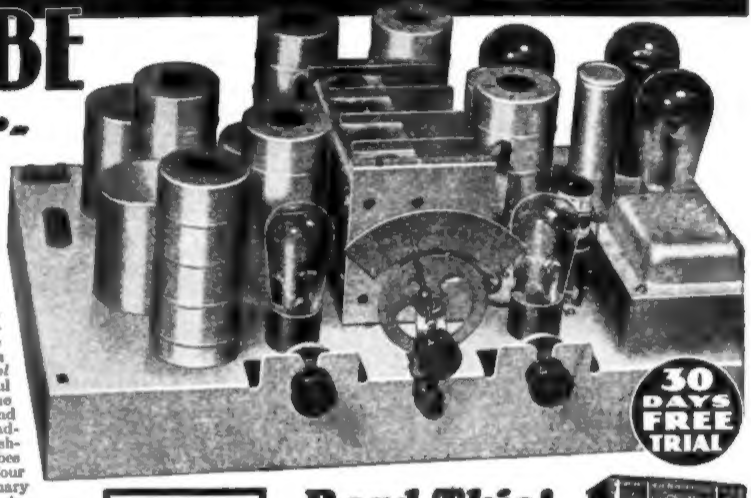

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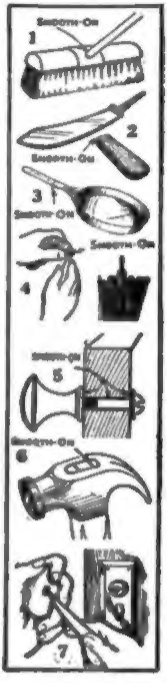

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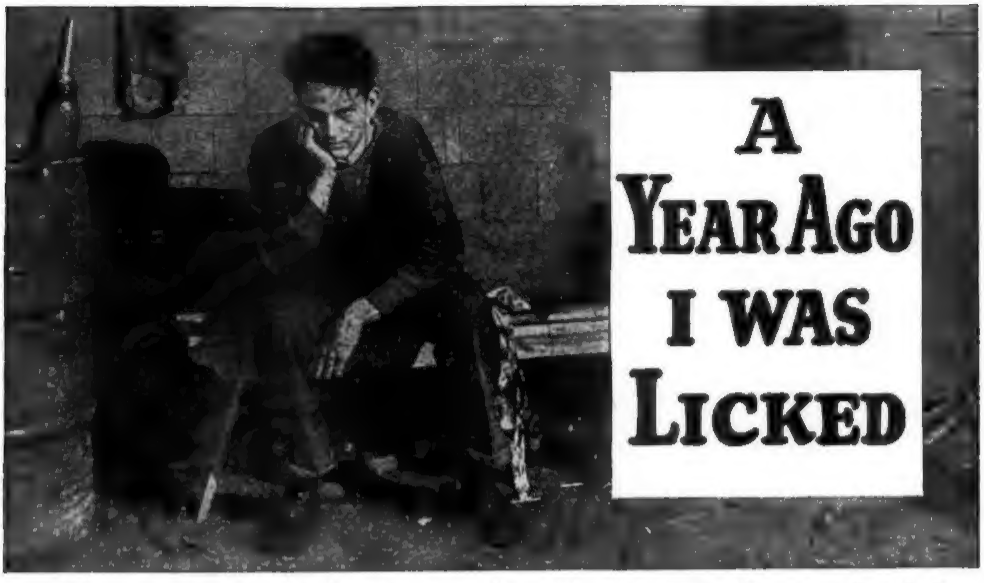


"Then Radio Training Raised Me from $15 to $70 a Week"

Licked!

What was the use of kidding myself. I was licked. Anchored to a measly, dirty, grimy job, pumping gas for the cars of fellows who had gotten ahead. Chained to long hours and low pay; condemned to ride street cars the rest of my life. Worse, never would I be able to give Mary the things she deserved.

Licked!

I slumped back into the street car seat, a dejected and broken young man. Just another gas pumper on his way to dreary, uninteresting toil. And then the challenge came! *"I'll Train You At Home For a Big Pay Radio Job."*

That statement seemed to jump out of the magazine the fellow next to me was reading. All I could see was that one line. But that was enough! It made me curious to read the whole advertisement, and that noon I bought a copy of the magazine.

It certainly did sound convincing. Maybe after all I could buy Mary the things she needed. Maybe I wasn't slated to be a gas pumper all my life. The advertisement said that Radio Training had lifted other men from failure and discouragement to success. Why not me? So I mailed the coupon.

In a few days came a free book, "Rich Rewards in Radio." It told about the big opportunities that awaited the trained man in the fast growing Radio industry. It told of chances to make big pay and have a pleasant job in Radio service work, in Broadcasting, in Talking Movies, in Television, in Shipboard operating, in Aviation Radio, and many other fields. It even told of the chances for the trained Radio Expert to establish a business of his own. What's more, this amazing book backed up everything it said with actual letters from men like me, who had become successful through the training of the National Radio Institute.

That settled it. If some of these other fellows, with even less training and education than I, could master the N.R.I. Course and get good jobs or go into the Radio business for themselves, I could do it too. I started that night on the road to success by enrolling at N.R.I.

By studying at home, I soon had a grasp of the principles of Radio. I also got broad practical experience by performing fascinating experiments on the equipment that was included in the course without extra charge. And by following the business suggestions that came with the very first lesson, I was soon making good money on the side by servicing radio sets.

In what seemed no time at all, I had graduated and earned my Diploma. And before I knew it, I—the ex-gas pump man—was a control operator with a great chain broadcasting station, averaging $300 a month in salary and spare time work.

* * * *

This story is just one illustration of what the National Radio Institute and the N.R.I. Course is doing for ambitious men and young men who can see the better jobs and bigger pay in Radio.

EARN WHILE YOU LEARN

The very day you enroll we'll show you how to do 28 jobs common in most every neighborhood, from which you can make extra money in your spare time. You get the plans and ideas that are making as high as $200 to $1,000 for others while taking my course. And at the same time, you will be getting a practical training, equipping you to make big money in full time Radio jobs. Our instructors give you their expert personal attention. Our staff is ready to answer all questions that come up in your work. You get a complete set of text books and apparatus, too, as well as an iron-clad, money-back agreement if you are not satisfied. After you graduate, you get lifetime employment service.

READ WHAT THESE STUDENTS SAY

"The Radio field is getting bigger and better every year. I have made more than $400 each month and it really was your course that brought me to this." J. G. Dahlstead, Station KYA, San Francisco, Cal.—"I have made over $2,000 in Radio since taking your course, and I am giving you the credit for it. Right now I am in charge of a repair shop doing repair work for 23 supply stores." B. D. Bailey, 1458 S. Humbold St., Denver, Col.—"When I started your course, I didn't have a set and frankly didn't know the first thing about one. But your course explains so thoroughly that I have made $840 actual profit from spare time work. I want to thank you for your cooperation throughout the course." B. L. Sellers, Monmouth, Oregon.

SEND FOR BIG FREE BOOK

The free book, "Rich Rewards in Radio," will show you how the N.R.I. tested Course makes it easy for you to get the training that can send you ahead in the fascinating, ever-growing Radio industry. Read about our 50-50 method of training, that teaches both theory and practical work. Get the facts on the big, modern experimental outfits that come with the Course. Learn about the five Advanced Courses, that fit you for specialized work. You get your choice of one of these Advanced Courses without extra charge.

It will only cost you two cents for a stamp to get the facts. Clip the coupon and mail it TODAY for my free book, "Rich Rewards in Radio." J. E. Smith, President, Dept. 2EH, NATIONAL RADIO INSTITUTE, Washington, D. C.

Mr. J. E. Smith, President
National Radio Institute, Dept. 2EH,
Washington, D. C.

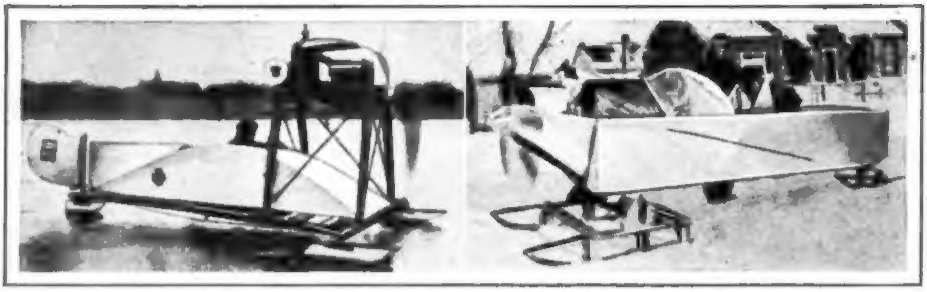
Dear Mr. Smith: Send me your book, "Rich Rewards in Radio," which points out the spare time and full time opportunities in Radio, Television, Talking Movies, Aircraft Radio. I understand this request does not obligate me and that no agent will call.

Name.....

Street.....

City.....State.....

(Please write plainly. Use margin if necessary.)



Farewell to winter! Here are shots made the past season which are reminiscent of sport to be had with motorized Slide & Glide machines. Left, see Warren Legg's sled. Right, meet Wellington Smith's buggy. Legg's job is powered with an old Metz engine, Smith's "Go Devil" with an airplane Henderson. Lots of fast action in both of them.

Andy's Shop Mail Box

The spring birds carol "Arise Sweet Phoebe," but Andy Monk shudders at the thought of shedding the winter flannels. What ho!—sprig has cabe! And the Annual Spring Growl hits the column. Sail in!

HELLO to you, and you and you! This is Andy again. I'm feeling a bit piqued (peeked to youse Arkansas guys) as I seat myself at the organ preparing the latest dish of Colyum Tripe. It's because of the weather a bit, and then again because winter has gone, and then because I have to do a certain amount of complaining over a few of the letters I get.

You fellas up around Snake River and Great Slave Lake better get busy and have your last snowball fight because down here in Minnesota the corn has poked through the loam and we'll soon be dishing it up on the cob, along with some of that RKO salve. You know—Rockwell's Korn Ointment, better known as butter. Invented by that famous vaudeville quack, Dr. Rockwell.

Then I'll be complete in my remorse. For not only do I have to think of winter flown, but summer will be here, with corn-on-cob, the home crop of winter-grown airplanes will be buzzin' round above, and I still will have those three dumb letters to answer.

One of the Great Griefs which settled about my conk when I invented this perfectly unique column was a direct result of my swell idea. I says to the eds I says, says I, "I'll be the world's first Corresponding Columnist."

Swell, says they, original like.

So we carried on in a world of fun, controversy, key-hole peeking and secret telling and all the while I answered all of your letters to the best of my ability, making many friends.

And as with any public figure (ahem) I got an occasional letter which was either too deep or too dumb to answer. The score is three now. And that's what's bothering me.

* * *

Has the end come of Andy, the man who sees all, who tells all, who knows nothing?

Not by a jugful. But what are you going to do with a clientele who for the last week has been pestering you with letters asking about the method of making pink fiddler crabs blush, how to carve a propeller, what is in luminous paint to make it loom, and then contributes a member who asks wheninell the Deep Ression is going to end? I admit this one has got me down.

All right. I feel like a vodvil performer who meets a hostile audience. I dare you to make me laugh! I dare you to show me! Louder and funnier, please!

Here's my answer to the lad who wants to know when the depression ends. I'll tell you all and get the answering done in a big way.

Mr. Stick-in-the-mud:

Asking me to tell you whether you should go into the burial vault business and when the depression will end is a large order. You are asking me?

I canna tell ye aboot vaults. I never ripped up an old grave and never monkeyed much with cemeteries. Maybe your local preacher could get in touch with St. Peter and ask about the condition of a few of the big stiffs who

(Continued on page 12)

Ed Fitzgerald of N'York gets thrills aplenty in his light hydrookedaddler powered with 3 h.p. Johnson, which planes the boat readily. Reminds us of the well-known Punkin' Seed.

SOLES 4½ CENTS

Heels 1 cent

New Improved SAVAsole Pays You $42 a DAY

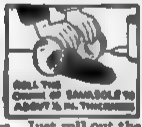
Up to

No more costly shoe repairs. No more wearing worn-out shoes with leaky soles that are harmful to health. This amazing invention—now perfected—saves your money. It's called Savasole, a scientific, plastic, repair set that puts new soles on worn-out shoes. Makes them like new for as low as 4½ cents a sole. Rebuilds run-down heels for as low as 1 cent. Easy way of applying. Just take a spoonful out of the can and roll it out. Trim it to size. See picture below. Then it cements on to the old sole and hardens overnight. You have a solid, non-skid, waterproof surface that covers all cuts, holes, cracks.

Cash In Now On This HARD TIMES NECESSITY

Now! So Easy!

A Child Can Apply



No mess. Just roll out the plastic Savasole to a thickness of about ¼ inch. Trim it to the size of your sole (See picture.) Then apply cement to Savasole and shoe. Press together firmly and let harden overnight. Wears better than ordinary soles — and can't come off.

After

This sensational specialty has captured the country and is filling distributors' pockets with gold. Even in hard times it has proved a gold mine for agents! We give you quick, one-minute demonstration that amazes prospects and compels them to order. Sure repeat business. Good territory still open. Rush coupon for Free Sample on leather and new exclusive territory plan.

AGENT Makes $135 in a Week

Hundreds of Other Letters Like This

G. C. Miller writes:

"I gave up my former connection where I ranged in earnings from $315 to $386 per month. I started out with three gross of Savasole. Since that time, my earnings have netted me over $135 a week and I am sure that I will soon hit $200 per week. Savasole has solved my financial problems, and you are the whitest bunch of people to work with I ever saw."

It's GUARANTEED!

Do not confuse Savasole with cheap imitations. Savasole alone is applied in one flexible plastic piece and dries thick, smooth and even. And Savasole is the only one that has the Bollman Double-Action Cement process that means Savasole cannot come off. It actually outwears the uppers. My money back guarantee protects you and your reputation.

Mail for FREE SAMPLE

R. R. Bollman, Pres.
PERFECT MFG. CO., E-41 Daylight Bldg., Cincinnati, O.

Please rush Mr. Bollman: Please send me a Free Sample of Savasole applied to miniature leather sole and tell me how I can make up to $42 a day. I am not obligated.

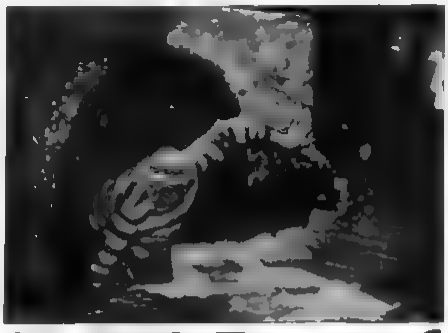
Name.....

Address.....

Town ..... State.....

Territory preferred.....

THE PERFECT MFG. CO., E41 Daylight Bldg., Cincinnati, Ohio



$1,000 Reward

For the Capture of This Man

CONVICT 6138, escaped from the State Penitentiary; Name, Charles Condray; age 37; Height, 5 feet 8 inches; Weight, 141 pounds; Hair, light brown; Eyes, gray.

Easy enough to identify him from his photograph and this description, you may say — but, Condray took the name of "Brown," dyed his hair, darkened his skin, grew a mustache, put on weight and walked with a stoop.

Yet he was captured and identified so positively that he knew the game was up and returned to the penitentiary without extradition. How was it accomplished? Easy enough for the Finger Print Expert. They are the specialists, the leaders, the cream of detectives. Every day's paper tells their wonderful exploits in solving mysterious crimes and convicting dangerous criminals.

More Trained Men Needed

The demand for trained men by governments, states, cities, detective agencies, corporations, and private bureaus is becoming greater every day. Here is a real opportunity for YOU. Can you imagine a more fascinating line of work than this? Often life and death depend on finger print evidence - and big rewards go to the expert. Many experts earn regularly $3,000 and more per year.

Learn At Home in Spare Time

And now you can learn the secrets of this science at home in your spare time. Any man with common school education and average ability can become a Finger [redacted] tive in surprisingly short time.

FREE The Confidential Reports No. 38 Made to His Chief!

IF YOU ACT QUICK—We will send you free and with no obligation whatsoever, a copy of the gripping, fascinating, confidential report Secret Service Operator No. 38 made to His Chief. Mail coupon NOW!

Write quickly for fully illustrated free book on Finger Prints which explains this wonderful training in detail. Don't wait. Mail the coupon now. You may never see this announcement again! You assume no obligation. You have everything to gain and nothing to lose. Write at once. Address

Institute of Applied Science

Dept. 23-55 1920 Sunnyside Av., Chicago

INSTITUTE OF APPLIED SCIENCE,
Dept. 23-55 1920 Sunnyside Ave., Chicago

Gentlemen: Without any obligation whatever, send me your new, fully illustrated, FREE book on Finger Prints and the free copy of the Confidential Reports Operator No. 38 made to His Chief. Literature will NOT be sent to boys under 17 years of age.

Name .....

Address .....

..... Age .....

ANDY'S SHOP MAIL BOX

(Continued from page 10)

swiped my 8-inch Crescent wrench three years ago. Their location is right along the edge of the airfield here.

About the currently rumored hollow spot in economic conditions: all John Rockefeller could say in a recent newsreel interview was "We have hopes." Cute?

I feel, however, pretty much like a cabbage grower who has his ranch for bunny fodder right alongside the Package Magazine Experiment Station on the other side of the field.

I was calling on Sam with an idea to setting my lamps on some of his big fun rackets that he's building. You know, we was a settin' on th' porch, and he was talkin', and I was talkin', and we was watchin' the settin' sun go down.

The subject of the depression came up.

Sam is the guy who is supposed to know everything, not me. The question had him stumped. Finally he called to Hi Wheeler, who ranches the cabbages.

"Hi," says Sam, calling across the field, "With world conditions the way they are, how in the deuce do you make a go of things on that place?"

Hi pointed out his hired man who was busy nursing young cabbages two rows away.

"See that feller there?" Hi called back. "He works for me, and I can't pay him. In two years he gits the ranch. Then I work for him till I git it back."

Yours truly,

ANDY.

* * *

There. Now I feel better. And let's do away with the moan about winter by giving the ice sled hounds their last yelp, eh?

The ice clippers shown at the head of this yere column on page 10 were built by MM monks. Here's what one of them says:

Fort Francis, Ont.

Dear Andy:

Enclosed is a snapshot of my sleigh "Go-Devil." I mounted my Heath Henderson on it and made better than 50 miles per hour on the lake with 2 inches of snow on the ice, carrying two. It has plenty of power to handle the two passengers on the road where the gravel sticks up through the snow or the concrete is blown bare. It weighs 440 lbs. The front runners are 56-inch tread and shock cord gives a flexible conection between the front sleigh and the fuselage. The back runner is mounted on a flat auto spring leaf. It handles perfectly in traffic taking turns easily, even a U turn at the intersection. Besides, it's strong enough to stand rough going and windshields give protection from the prop blast. I am planning a trip to Winnipeg—its 300 miles by road.

Yours truly,

WELLINGTON SMITH.

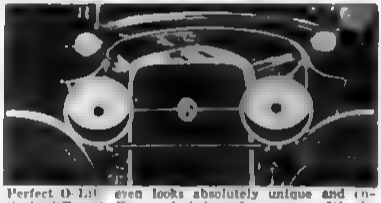
There you are. Complete, concise, informative. That's this member of the great Smith family. Another lad who makes the column with his let-

(Continued on page 14)

DANGEROUS DIMMING ENDED..
Road Light Doubled!

AMAZING INVENTION FITS ANY HEADLIGHT...
Revolutionizes Night Driving!

At last! Night driving suddenly becomes actually SAFER than day! At one sweep, a tiny, inexpensive invention banishes glare yet doubles road illumination! Cuts through every light on the road! Fits any car. Use coupon QUICK for liberal FREE TEST OFFER!



Perfect-O-Lite even looks absolutely unique and entirely different. Every sale brings dozens more. It's the greatest "self-advertiser" ever known.

IT IS a well-known fact that motor car manufacturers have solved every big problem except one. As soon as the sun goes down at night, the highways of America break forth into a constant, rushing stream of "dimming and damning." Speed is cut down one-third to one-half. Every Monday morning finds the highways littered with broken glass, wrecks, cars in the ditch, overturned, shattered against telephone posts. Every man who ever groped dizzily down the highway in traffic at night knows the horrible sensation of being half-blinded by cars on his left, unable to see the ditch on his right, his own lights seeming dim and shadowy and practically worthless. Now, in a twinkling, this curse of night driving is lifted completely and inexpensively from the shoulders of the entire motoring world!

FITS ANY HEADLIGHT

This new lighting discovery is called Perfect-O-Lite. It is a little invention that replaces the "bulbs" in your automobile headlights. No extra wiring or installation. Yet actually DOES double road illumination. Banishes need for Glare Shields. Cuts through the other fellow's light, yet absolutely cannot glare in his eyes. Makes ruts, animals, children, detour signs, etc., far easier to see. Makes night driving at 40 to 50 miles an hour safe and easy.

The secret of this new light is in the kind of "beam" or "ray" that it throws. Instead of ordinary light this new invention throws a solid beam of double reflected or "infused" light down the entire roadway. Shows up ditches at the side as well as distant objects, absolutely clear, without the usual flickering shadows. Space here limits further discussion of the facts.

MAKE YOUR OWN TEST FREE

Under an introductory offer you are now invited to be the judge and jury without risking one penny. The coupon brings full details of the invention, offer of a set on FREE TEST and facts about agent's money making opportunities. Mail the coupon without obligation, TODAY!

Lights entire roadway including ditch. Absolutely no glare to on coming car. Unique double reflected infused light beam cuts through every light on the road. No flickering "shadows." Even lights distant objects with daylight clearness.

AGENTS ON SPOT NEW!

This new invention unquestionably opens up one of the most amazing money-making opportunities ever presented. Here actually IS that chance for $5 to $14 in your FIRST hour, $5,000 to $10,000 THIS year, with no limit WHATEVER for Distributors! Fleet owners buy quantities. Wallace & Tiernan, N. J., trucks just equipped. Other big orders flooding in. A real self-advertiser; each car equipped is seen by thousands. Here are some recent orders. Ranney, Me., 1000 sets; Bradner, Ariz., 500 sets; Hoffman, 555 sets. Start full-time or spare-time. Use coupon for FREE TEST OFFER and details of Exclusive Territory, etc.

Throws all light on roadway. Shoots through fog, mist, rain and snow like magic!

HACKMEISTER-LIND CO.
Dept. E-91 Pittsburgh, Pa.

Hackmeister-Lind Co., Dept. E-91, Pittsburgh, Pa.

Rush details of your Free Test Offer also send facts about agent's money-making opportunities without obligation.

Name . . . . . .

Address . . . . . .

Town . . . . . State. . . . . .

Free

YOURS for the asking! No cost whatsoever! No conditions. Just reply promptly. This offer is open to all who speak up NOW!

BETTER JOB BETTER PAY

Mail Coupon NOW!

If you earn a penny less than $50 a week, rush the coupon to me for my PAY RAISING PLAN. I have doubled and tripled the pay of many hundreds of men, who now earn $60, $70 and even $100 a week. Here is an opportunity you must look into. Get started NOW and be ready when your time comes. I furnish without extra charge, drafting tools, drafting table and other equipment WHEN YOU START.

Drafting is the field of greatest opportunity. It gives you the chance to break away from the slavery of low wages and uncertain employment. There is always a demand for draftsmen with PRACTICAL TRAINING and many opportunities for quick promotion and exceptionally GOOD PAY. Will you answer the call?

Don't Send Money

Don't let lack of ready cash hold you down and rob you of success. It's men I want—not a lot of money. I want you if you mean business, and I am ready, not only to train you for a good pay position, but to help you in other ways, even to earn extra money while learning. For over 30 years I have been training and helping men to success in drafting. Let me do the same for you. With my practical methods you can quickly complete my entire course and be ready before you know it, for an important position in engineering or industrial work.

Take a look at these tools. Not a student's outfit at all but an imported set of professional drafting instruments.

FREE

of all extra cost. You also get an engineer's drafting table and other standard supplies when you start.

Send coupon for "Pay-Raising Plan."

FREE PAY RAISING PLAN

ENGINEER DOBE, Div. 25
1951 Lawrence Avenue, Chicago

Send me free and postpaid, your book, "My Pay-Raising Plan," also Practical Draftsmanship Book and Special Offer on all Drafting Tools and Table furnished to me without extra cost.

REPLY PROMPTLY

Name .....

Address .....

City ..... Age .....

ANDY'S SHOP MAIL BOX

(Continued from page 12)

ter this month is Warren Legg, who runs the garage at Champlin, Minn. Mistah Legg deposes:

Champlin, Minn.

Dear Andy:

I am enclosing a picture of an ice sled which a friend of mine, James Brown, and I built. Also a drawing of the frame.

This machine was built for less than $10.00. However, much of the material used was picked up around my shop.

The motor is a 1915 Metz. The frame is of steel cut from Model T frames. The motor struts are cut from the same material. The fuselage is of wood with muslin covering. There are two coats of dope and three coats of silver paint. The prop and hub were bought from an airplane Co. The prop was a nine footer, but I cut it down to 6 ft. 3 in. We have clocked it at 75 miles an hour on clear hard ice with two aboard. Will be glad to answer any letters any one may care to ask on this sled if they'll write me at Champlin.

Very sincerely,
WARREN LEGG.

Interesting, says I. Twice as interesting as my stuff. By golly! There's an idea! Finish off the column with nothing but letters.

Zippee! It's as good as done. Now for a boat. And here we have it.

246 W. 25th St.,
New York City.

Dear Andy:

Fired with the intense desire to see my name in print and having something that might be interesting to some one, I'm sending this letter and some prints for you to use as you wish. I hope they make your excellent column.

This little boat is home-built and only set me back about eight bucks, exclusive of motor. I had the motor and built the boat to fit, so to speak. Had been using it on an old dinghy but as this was slow and very leaky, decided to see if I could get a boat to plane with a low power motor. It is a Johnson 3 and is by no means a racing job but it makes my little tub step. Have no trouble getting it up on top of the water which is sometimes hard to do even with step-planes.

She was built without plans or like any boat of ordinary design. The two side boards take all the weight and strain as the ribs only help to hold the bottom, which is a single piece of ¼-inch ply-wood. She has no step or bottom flare except at the prow. This bottom curves upward from the center making the boat into a kind of water toboggan. She planes at all times but is very wet in all but the calmest weather. Light weight makes this an ideal boat for a lake but as I use it on the Hudson I have to watch the ferry boats and river steamers as the rollers from these have bounced me out three times for not being careful.

Hope this letter doesn't cause you to establish a word limit on all letters addressed to you but I promise to answer all (?) that I get, long or

(Continued on page 16)

What Would $3,000.00 CASH Mean To You RIGHT NOW?

I WILL PAY $250.00

for the Winning Answer to this Question

I am going to give $3,000.00 to some deserving man or woman who answers my announcements. *You may be the one to get it!* But, before I give it to anyone I would like to know that the money will be used wisely. WHAT WILL YOU DO WITH THIS FORTUNE, IF I GIVE IT TO YOU? Just answer this question—tell me in a sentence of 20 words or less, and in your own way, what $3,000 cash would mean to you right now—*nothing more to do toward the $250.00 cash prize!* Sounds easy? It is easy! The first answer that comes to your mind may win the prize. No selling—no soliciting. There are no strings at all to this amazing prize offer of $250.00 cash.

20 SIMPLE WORDS WIN $250.00 FOR SOMEONE, MAYBE YOU!

Nothing More For You To Do!

$250 Prize given just for the winning answer to my question

There is no way you can lose. Simply tell me what $3,000.00 would mean to you right now, if I give it to you. The prize for the winning answer is $250.00. Just sending an answer qualifies you for an opportunity to win $3,000.00 in final prize distribution. Think what an amazing opportunity—why, many people work hard for a lifetime without ever having such a vast amount of money as you may now win.

Think, NOW, What Would $3,000.00 Mean To You Right Now?

Would it mean a business of your own; would it mean investment in bonds; would it mean paying off a mortgage on your home or buying new furniture and clothes? Maybe it would mean an education for you. Just think what $3,000.00 could mean to you! Think of all the things you could do with it. Plan now—then write your answer—rush it to me at once. Yours may easily be the winner. All replies become the property of Richard Day, Manager.

BE PROMPT! I Will Send You $100.00 Cash Certificate AT ONCE!

To make it worth your while to be prompt in sending in your answer to my question, "What would $3,000.00 Cash mean to you RIGHT NOW?"—if you will see that your letter is postmarked not more than three days after you read this offer I will send you a Cash Promptness Certificate entitling you to an extra $100.00 in cash should your reply, in the opinion of the judges, win the $250.00 cash prize offered above.

Hundreds Have Won

Throughout the past year we have given financial help to hundreds of deserving people in all parts of the United States . . . we have given away hundreds and thousands of dollars in prizes. Beemer just won $750. Beatrice Lauter won $500. Hundreds more made happy with huge prizes and cash awards. Now is YOUR opportunity—ACT TODAY!

RULES

Only one answer accepted from a family. Use your own name. $250.00 given for best answer to "What Would $3,000.00 Cash Mean To You Right NOW?" Answers must be postmarked not later than Sept. 15, 1933. Judges will consider answer only for practical value of the idea, construction and spelling. Neatness or ingenuity of submitting answer [redacted] sidered. Duplicate prizes will be given in cases of duplicate winning answers.

RICHARD DAY, Manager
309 Cheapside, Dept. 52E Cincinnati, Ohio

Just Sending Answer Qualifies You for Opportunity to Win $3,000.00

Some say I am wrong. They say that giving money to people will not help to bring back prosperity. They say that the people who get money from me will spend it foolishly. Now I want to find out. I am going to give away over $5,000.00. Someone is going to get $3,000.00, all cash. If I gave you the $3,000.00 what would YOU do with it? Tell me in 20 words or less. Just sending an answer qualifies you for the opportunity to win $3,000.00. If you are prompt I'll send you a $100.00 Cash Certificate AT ONCE! Here is an opportunity of a lifetime. Costs you nothing to win. Rush your answer today. Send no money—just tell me what you would do with the money, if I gave you the $3,000.00 that I have promised to give to some yet unknown deserving person.

Richard Day

Use the Coupon or write letter with your answer

$250.00 PRIZE COUPON

RICHARD DAY, Manager
309 Cheapside, Dept. 52E, Cincinnati, O.

$3,000.00 cash would mean this to me right now: (Write your answer plainly here, in 20 words or less): .....

.....

.....

.....

Name .....

Address .....

Town ..... *State* .....

Date I read your offer .....

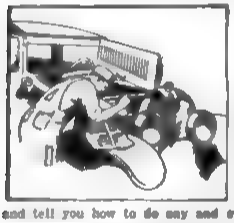
SIX BIG AUTO BOOKS ALL SHIPPED FREE

on approval; whether you want to qualify as garage owner, auto repair expert or merely wish to know how to keep your own car 100% efficient, look at these books—they are sent to you for free examination. This brand new edition has been prepared by a large group of America's greatest automotive engineers. Anybody who can read will understand them, for this great automobile encyclopedia is a veritable gold mine of valuable facts. Take advantage of this offer now, send in the coupon for FREE examination. You don't pay us a penny, you don't obligate yourself to pay anything unless you decide to keep the books. Just tell us you want to see them and the full set of 6 great volumes, just off the press, will be sent to you. Read them, look them over and prove to your own satisfaction that one fact alone, which you will find in them, may save you an expensive repair, or help you to a better job

AVIATION MOTORS
FREE WHEELING
SYNCRO-MESH
OUTBOARD MOTORS
MOTORCYCLES
TRACTORS
ALL FULLY COVERED

Brand New 1932 Edition

Imagine books which are so new that every page is right up to date—wiring diagrams, construction details, service problems—are all right up to the minute. Nowhere else can you get so complete and up-to-date information. Over a million dollars of resources have enabled us to give you the most authoritative books on the subject ever published. Everybody interested in automobiles in any way will welcome these books published by the world's largest publishers of Technical Cyclopedias (est. 1897) with agencies all over the world.



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ANDY'S SHOP MAIL BOX

(Continued from page 14)

otherwise. Of course, those with the self-addressed and stamped envelopes.

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Thanks,

EDWARD D. FITZGERALD.

Personally I was right glad to get that letter from Fitzgerald. It shows what can be done in the way of getting a little stepper up on top with a little twin like the 3 h.p. Johnson, than which there are few whicher outboards.

Please believe it, Mr. Ripley. This is a model. A model of a Rathel biplane, which was built with Canadian flavor by Art Warner, of Fort Erie. She uses rubber bands for power.

All right—here's another Canuck (whatsamat wit United Statesers? Layin' down?) who has done something worthwhile. Listen:

Fort Erie, North Ont.

Dear Andy:

This enclosed picture is of a model of a Rathel R3 biplane from plans supplied by R. R. Retz, of Farmland, Ind.

It is a 6' 8" scale model with a chord of 12", all dimensions were reduced to 1/3 scale, and it has practically every part of the real machine. It has plywood ribs, cut-out skeleton for lightness, and it is very strong for its weight. I have flown it a little by shoving along the ground against a light breeze by the tail and letting it rise, then let it go and glide to a landing by itself.

Rubber bands don't seem to have enough pep to drive it, but I hope to get one of them small gasoline motors, and it shouldn't have any trouble flying, as it seems to balance very good in the air.

I would like it very much if you could tell me where I could obtain such a motor, and about what the cost would be.

Yours truly,

ARTHUR WARNER.

The shot of the Rathel model is shown in this column right smack near where this type sits.

Rod La Rocque, famous movie and stage star, who has read every issue of Modern Mechanics and Inventions since the first and keeps them all, bound in quarterly volumes, in his home workshop for future reference, sends a letter to Jay Earle Miller on the importance of planning your workshop lighting and power outlets with care when you do your wiring. Rod, by the way,

(Continued on page 20)

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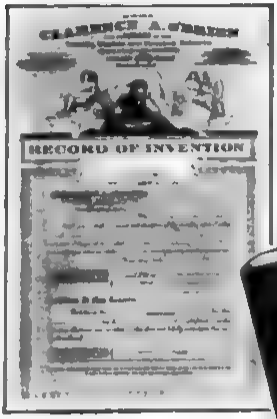

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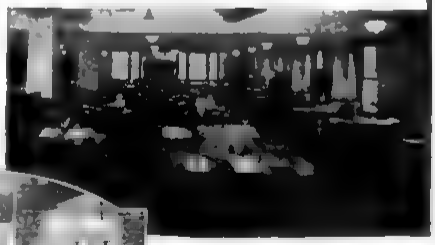

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Registered Patent Attorney

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D. C.

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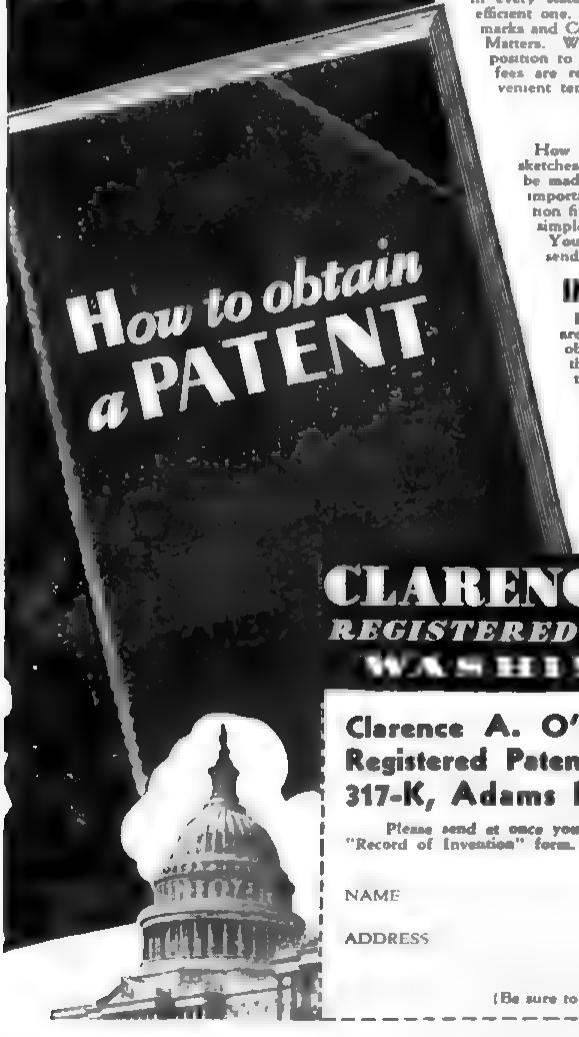
TENTS

FOR... INVENTORS



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ANDY'S SHOP MAIL BOX

(Continued from page 16)

recently suggested to Jay that, if available, 220-volt, three-phase wiring should be installed, with the necessary meter, when a home workshop is wired. Then the circuit can be tapped for 110-volt lighting and small power motors, while 220-volt can be used for lathes and other larger machines. Here's part of his letter:

Dear Jay:

I can't tell you how much I enjoyed your fine letter and the extremely interesting photographs you sent me.

Your article, "What's Keeping Television Out of Your Home" has been duly read and enjoyed. . . . Other articles in the current issue have been noted and probably will be read in my berth tonight. I have two suggestions to make regarding the article on page 168 entitled "A Complete Home Workshop." There is no reference, either in the drawings or text, to a circular saw, which is certainly necessary in a COMPLETE workshop, particularly one of the size therein described.

And there is no "dope" on arrangement of electric outlets and lights. I make this point about lights and outlets because, paradoxically enough, it seems to be the last thing the workshop enthusiast considers. They are generally so over-anxious to get things set up that they forget all about the wiring, and, therefore,

(Continued on page 22)

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Clifford Lewis

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"I did. I stuck to my spare-time study and finished it. After that I made real progress.

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ANDY'S SHOP MAIL BOX

(Continued from page 20)

overlook the possibility of getting the best possible scheme. However, it's not really serious, but the general layout of the shop in the article is so excellent that I'm sure it will be considered a model and for that reason, and because of the fact that I know so many fellows who have struck snags in arrangement of outlets and lights, I would like to see some diagrammatic suggestions on it. Possibly an article can be done on it in an early issue.

Always, ROD.

Swell, Rod. That's a gooda one, that suggestion about outlets for the shop. Suppose you do one for us. Your story in the Pack Mag first issue got a lot of fans for Slide Rule Sam, who claims I am a snoop hound and a newsgatherer of the first order.

FOR COPYING BLUEPRINTS

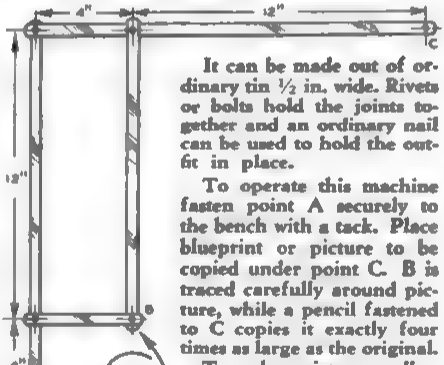
HERE'S an idea which a Hangar Hound is passing on to the rest of the Gang with my hearty approval. It's an old gag, but that doesn't detract from its usefulness.

Katy, Texas

Dear Andy:

Andy, ol' boy, I've worked out an idea that once helped me, so I thought I'd pass it on to the rest of the grease monks.

At one time or another a fellow will want to copy a blueprint or picture to its exact proportions, either to enlarge it or make it smaller, so here is the sketch of an enlarging machine which is easy to make and simple to use.



How to build a pantograph in one lesson.

It can be made out of ordinary tin ½ in. wide. Rivets or bolts hold the joints together and an ordinary nail can be used to hold the outfit in place.

To operate this machine fasten point A securely to the bench with a tack. Place blueprint or picture to be copied under point C. B is traced carefully around picture, while a pencil fastened to C copies it exactly four times as large as the original.

To make a picture smaller, place picture under point C, trace around carefully, and a pencil clamped to point B will do the work. A is always kept at the same point.

B, as shown in the inset, has the end of the bolt tapered down to trace around the picture easily and accurately.

A ½-inch hole in the tin at point C will securely hold a pencil, if the pencil is whittled and put in like a peg. So long,

GARBER L. SHORT.

(Continued on page 24)

You, too, can be an Author!

and you don't have to write a thing except your signature

Here's how—

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ANDY'S SHOP MAIL BOX

(Continued from page 22)

Thanks a lot, Shorty. Now, if the sale of large-size blueprints falls off we can sue you for damages. That would be a mean trick, wouldn't it?

Here's a nifty:

Hilldale, Kansas

Dear Andy:

I've just finished reading Jay Earle Miller's yarn, "Do You Weigh More in Denver or New York?" A pretty good story if you can understand it. I can't very well.

I've just thought of an idea—an idea that would save several million horsepower per year. Here goes:

When a person is cutting wood, driving posts, killing snakes, etc., he should face the west before swinging the sledge, club, hammer, or whatever he may have east over his back. (Scientists say it weighs less this way.) Then he makes the down stroke to the west so that the sledge will weigh more. In this way he will save much energy over the old haphazard methods.

But here is the trouble with the theory: Would it be easier to do it this way? Face the east, raise the sledge, go around the post, face the west, and make the down stroke.

If this great problem could be solved it would be a great thing for mankind in these labor-saving days. And of course this could be applied to machinery such as: which way a steam shovel should swing its load to save wear and tear on the outfit.

Of course, I might not have the men facing the right way or swinging the sledge the right direction, but I believe the theory is very sound.

Hoping that you may be able to solve the problem O. K.

Yours truly,

KENNETH LLOYD.

P. S. You don't need to answer the problem now. I think I have it figured out. A man raises the sledge over his head to the east, then hands it to a man facing the west to make the down stroke. How's that for the solution, Andy? It ought to solve the unemployment problem too.

Well, Ken, I've figgered and figgered, and here's what seems to me to be the best way to install fence posts:

First you plant a few acorns in a neat row at approximately the position in which you wish to construct your fence. Then you sit under a quince tree with a shot gun and chase away any squirrels who might have the temerity to think they buried those acorns. This can be dispensed with after the acorns have grown to a size which will permit them to shift for themselves in the guise of oaklets.

The next operation consists of taking a different girl out to dinner every night. When you find one who offers to pay the check you know that the time is ripe, for by now your acorns have grown so that you would hardly recognize them.

(Continued on page 26)

Yet a short time later she was amazed at the progress I had made BY MYSELF this easy home-study way

FOR MONTHS I had been taking lessons from a private teacher, progressing slowly but surely to a time when I would be able to get the musical good times I craved.

And then because of business I had to move to a small town where there was no music teacher. I was in despair. All of the long weary hours I had spent practicing—to say nothing of the money—were in vain. My teacher too was sorry to see my musical advancement stopped.

And then, while looking through a magazine, I saw an advertisement for the U. S. School of Music which claimed that learning to play by their method in my own home—without a private teacher—was actually as easy as A-B-C. They offered to prove it by a free demonstration lesson.

I could scarcely believe it, and I showed my teacher the ad.

"You'll never learn," she cried. "You'll only waste your money. No one can learn to play that way."

But I was desperate and I decided to investigate the course. When the free demonstration lesson came, I saw at once that my teacher had been wrong, for here, at last, was a method of learning to play right in your own home—with no outside aid—and in less than half the usual time. I sent for the course at once.

These fascinating lessons were like a game. Everything was right before me, notes, pictures, text, everything I needed. Almost before I knew it I was playing real tunes, right from the notes.

Several months later I was at a week-end party in my *old* town. My teacher was a guest at the party also. When she asked me how I was getting along, I told her that I could now play most popular music, as well as some classical pieces.

She laughed. "You'll have to prove that to me, Bill."

"All right," I said, as I walked over to the piano.

"What does Bill think he's going to do?" someone asked.

"It's just his little joke," laughed my teacher. "He's making believe he can play."

"That's right," I said. "It's a joke—and a good one."

Right then I swung into the haunting refrain of "Time on My Hands." I knew that they were waiting—ready to jeer. Then I sensed a change. They were listening, really listening with enjoyment and surprise. At the end of the piece I turned smiling and faced them.

"Why, Bill!" my teacher exclaimed, "how did you ever do it? A few months ago you could scarcely read music."

They all fired questions at me. How had I learned in such a short time? Where had I studied? How had I found a teacher? But I kept my secret to myself. In a few minutes they were all begging me to play for dancing.

Later that evening my former teacher asked me again how I had learned to play so well, so quickly. When I told her I had learned solely through the famous U. S. School method, she could hardly believe it.

"All that you've told me tonight has been a revelation, Bill. You know, I'm convinced that the U. S. School of Music could help me, too—help me teach others to play easier and quicker."

You, too, can learn to play your favorite instrument right in the privacy of your own home, without the aid of a private teacher, and at an average cost of only a few cents a day.

You can't possibly go wrong. First you are *told* how to do it—then a picture *shows* you how—then you do it yourself and *hear* it.

Free Booklet and Demonstration Lesson

To prove how really simple this course is, the U. S. School of Music has arranged to send you a Demonstration Lesson and Explanatory Booklet—absolutely free! No matter what instrument you choose to play, the Free Demonstration Lesson will show you at once the amazingly simple principles upon which this famous method is founded. You will see for yourself just how anyone can learn to play his favorite instrument *by note* in less time and at a fraction of what the old slow methods cost. The booklet will also tell you about the amazing new *Automatic Finger Control*.

If you want new popularity—if you want to have a host of friends and be invited everywhere—get these musical good times you've been missing. Fill in the coupon below—at once! Don't delay—you will not be obligated in any way. Instruments supplied when needed, cash or credit. U. S. School of Music, 2625 Brunswick Bldg., New York City.

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ANDY'S SHOP MAIL BOX

(Continued from page 24)

If you've had good luck with the girls, the row of acorns will have now become a row of oak trees, each one from six to eight inches in diameter.

Now all you have to do is to cut these trees off at the desired height, and you have a row of fence posts on which absolutely no horsepower has been wasted.

Of course, if you run into a tough streak of luck, and can't find a girl who will pay for the chow the trees may have grown much larger than a self respecting fence post should be. In this case you can start all over again.

But be careful after planting the acorns, Kenneth. Don't fall asleep and let the squirrels get you.

* * *

Gee, do I feel swell now? And can I laugh? Can I now? Boy O boy can I laugh! Because I get a bang out of this'n:

Hello Andrew:

You old grease slingin' monkey! If it wasn't for you I'd have quit MM long ago. Enclosed you will find a couple of photographs which ought to interest any or all fellows who are followers of new things from back country.

The first picture reveals what not to do to a Heath Parasol if you want to be a successful airplane builder.

The inventor tried to tack on a lot of unnecessary stability and due to the fact that the h.p. is overloaded with stability, the only possible outcome was failure.

Also the builder didn't build the fuselage right and it buckled up on them, in the picture it is sitting on a 2x4 on two horses.

The second and third pictures are front and rear views of what a brain wave washed ashore to a local inventor.

Here is a photograph of the latest Ohio dish in dirigibles.

It is a new type dirigible or rather a model of the new type and is supposed to do 200 m.p.h. with 100 passengers (and a duck,—Andy).

The model is 60 feet long and 10 feet wide and therefore claimed to be the world's largest model. It is built on a 10 to 1 scale.

The front nose is stepped in so as to scoop the air into the six propellers and thereby increase the air pressure and, of course, Andy, the speed.

For a speed test a 2,000-foot track, narrow gauge, was built and the model equipped with 6 Gen. Elec. motors totalling 7 2/10 h.p. to which were attached props with a 29½" pitch. A speed of 35 m.p.h. was attained in 300 feet. The model weighs 1800 lbs.

(Continued on page 28)

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ANDY'S SHOP MAIL BOX

(Continued from page 26)

The full scale ship will be 600 feet long, 100 feet wide, and 120 feet high. It'll have 6,500,000 cu. ft. capacity. It is so designed that the 100 passengers are to be carried on either side below while the gas fills the top of the arch-like design. The motor mounts can be made into wings to increase the lift from 3 to 5 tons.

Sincerely,
C. A. ARMS.

"The horsepower is overloaded with stability," says C. A. Arms, "so the result was failure. Here's what not to do to a plane."

I WAS in a hospital not so long ago. I feel for any gents what gets themselves in for any back work in a white wings ward of one of these chemical factories. Phooie for whiffs!

So right here goes a letter from an army man over near where the Laundrymen and the Jugglers are swatting flies off my old pal Floyd Gibbons.

Station Hospital,
Fort Mills, P. I.

Dear Andy and MM Fans:

The P. I. stands for Philippine Islands. Yes, we get the Double-M magazine here for fifty-five centavos, i. e., twenty-seven and a half cents in good old United States nickels.

I don't think I have seen airy a word in your column from the Philippines and I have ironed the kinks outa my Portable Royal and am gonna cry on your shoulder for a minute. I am a pill-rolling Sergeant, not hardboiled, but a Sergeant just the same. We do not have airplanes here on Corregidor but the Army sends 'em over from Nichols Field now and then so we can't forget what they look and sound like. I wanta ask you a couple of questions, if I may take that advantage of you. They are down below.

I wanta know where I can get plans for building the following named planes and about what it will cost me to procure them: The Heath Baby Bullet, The Heath Parasol, The Heath Mid-wing, The Lincoln Sport Plane (biplane), Piepento! (is that right?) Camper. The fact that I am in the Army has not dampened my ardor to one day build and fly one or more of the above planes. If you can spare this information I will appreciate it. I have seen the plans before in your magazine but was unable to get copies of them and would much rather have shop-prints or the blue prints.

I helped to build a light plane since I came here in '29, but one of those tricky air currents from across Manila Bay got the best of

(Continued on page 34)

Here is a BLAZING MESSAGE TO REAL Red-blooded HE-MEN!

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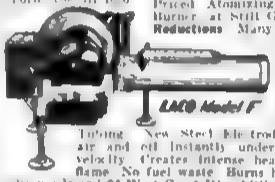

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ANDY'S SHOP MAIL BOX

(Continued from page 28)

the argument on its maiden flight. We carried it to the hangar in a wheel-barrow. The Philippine Air Taxi Co. own and operate four planes commercially here. They have a Stinson cabin plane with Lycoming motor, two Wacos with 165 h.p. Wright and a Klemm with a Salmson motor. The latter is a training plane. These planes are equipped with pontoons and used in inter-island service. One is used as a landplane. The Army has many service planes here and has helped to push aviation along by opening landing fields in the various islands.

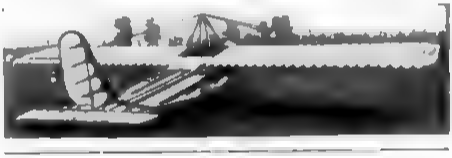
May I hear from you by mail or through your column? With best regards to you and the fans, I hope to remain a loyal reader of the MM-mag.

Yours truly,

RUFUS R. WALTON.

Sarge, old pal, you're telling me? I was a sergeant in the marines and was stationed at Cavite in 1921-22. You doan believe me? Say, did you ever bend the elbow at the "Silver Dollar" or "Poodle Dog" or—

Yep. Little Andy has been around, boys.



Here's a bird from Ioway, down where the tall corn grows. It was built by Milford Thompson, who flies it with a V twin.

And, oh, by the way Sergie, old pal. You want to see a nice little plane? Glim your optics on yon ship yonder. Here's a whiff of Ioway prop fodder from non other than Mil Thompson. Catch it:

Eagle Grove, Iowa.

Dear Andy:

Just to refreshen your memory to the fact that you once expressed doubt of a Vee-type motorcycle engine successfully flying a plane, wish to state you are all wet.

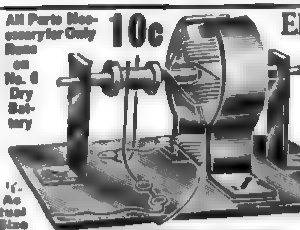
Please pass the optics over the snap shots enclosed. This outfit, designed and built by the writer, was tested a short time ago, and to date has made a total of fifteen flights, longest of which has been 30 minutes. All the flying has been done by a transport pilot, Sid Cleveland.

The general dimensions are: Span, 26 ft., length, 17 ft., wing area, 120 sq. ft., weight, empty, 245 lbs., loaded, 450 lbs. Performance: Top speed, 65 m.p.h., landing speed, 30 m.p.h., take-off run, 175 ft. (measured), climb, 350 f.p.m. Motor, Harley 74, inverted. However, considerable work has been done on the motor. The usual flywheels have been discarded, a counterbalanced crankshaft being used, thereby saving 20 lbs. weight and makes the motor

(Continued on page 36)

ELECTRIC MOTOR

All Parts Necessary for Only 10c



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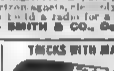

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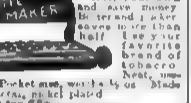

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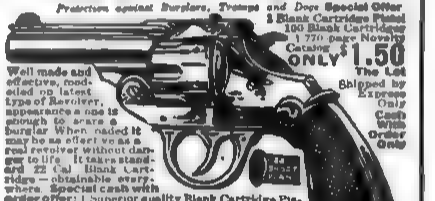

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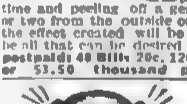

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Complete set of drawing instruments If you send for these drafting books NOW. These instruments are made of the finest of German silver are absolutely accurate and are packed in velvet lined leatherette pocket case. Real $10 value but free to you with these books.

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American Technical Society, Dept. D-5320, Drexel at 58th St., Chicago, Ill.
Send for 10 days free use New 5 volume set of drafting. I will pay the few cents delivery charges. If I wish, I may return books in 10 days and owe you nothing but if I decide to keep them I will send $2.00 after 10 days, then only $2.00 a month until $10.00, the special introductory price, is paid. Send Brand New edition and include drawing instruments

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Address .....
Employer .....
Employer's Address .....

The NEW HOW-TO-BUILD-IT BOOK — NOW ON SALE.

ANDY'S SHOP MAIL BOX

(Continued from page 34)

much snappier on acceleration. The fins on the cylinder heads have been changed in such a way as to eliminate pockets, thereby assisting in cooling. The exhaust ports have been greatly increased in size, allowing exhaust to get out (right now). Same oiling system is used, only oiler is set to run wide open, and seems to work out fine.

Inverting the motor makes it much easier to mount, also allows a good drop for the gas feed, short manifold, and is more compact. Prop used is 5' 2" dia. by 2' 9" pitch, own design. To date we have had no trouble with motor nor ship, whatever.

Very truly yours,
MILFORD THOMPSON.

Wal, I'll swallow my pride! Looks as if, eh?

* * *

Which reminds me. You lads who are up on your engine-knew-itty and who for one reason or another haven't been able to settle on a converted motorcycle motor, or a Ford, or sumpin', will be interested in the 40-h.p., two-cylinder "Cross Country Twin" opposed airplane engine being built by the Pack Mag Experiment Station. Parts and castings can be had for it. Trundle to the same news stand you git this copy of MM at, and ax the deeler for vol. 1, no. 2 issue of the Mechanical Package Magazine. All the dope on the Cross Country, plans, etc., are in it. Mechanical Package Magazine.

* * *

There, now, P'fessor Wing. I wasn't peeking, that day. I only sauntered past the window looking for leaks in your rain gutters up under the eaves. Don't I turn the other cheek? The above publicity is free, providing you put away the shot gun. And its load of rusty nails.

Now comes Oscar Gibson, appellant, who deposes and asks who in heck can help him. Anybody? Write direct to him:

Andy's Shop Mail Box:

For some years I have been taking all kinds of Mechanical and Scientific magazines, and while I don't pretend to be a crank, I just couldn't get the magazine that suited all around. It remained for a lad about 13 to steer me to M. M. and believe me it was no bum steer. I can now rest content.

I wonder if any of the shop fans can give me any dope on changing a 35 m.m. movie projector to use 28 m.m. film. I have a 35 m.m. motor-driven suitcase projector, good as new, but the Ontario Gov. says an amateur cannot use 35 m.m. film. I intended to swap it for a 16 m.m. or a 28, but as I could not run across anybody to swap with I thought the next best would be to change it to use 28 milliameter film. If any of the shop fans can give me any information I would certainly appreciate it.

Wishing M.M. continued success, I remain

Yours sincerely,
OSCAR H. GIBSON.

The next letter off the spindle comes from noo

(Continued on page 38)

Learn All About Autos AT McSWEENY'S

Just A Few Weeks To Prepare For A Big Pay Job

NOW is the time to learn a trade that will insure your future, that will make you independent of hard times, that will put you on the ladder of success—to climb to any heights of big earnings—limited only to the extent of your ambitions. Get into the nation's biggest industry where there are more opportunities than trained men to fill them. Learn autos at McSweeny's—all about them—in just a few short weeks—a trade that will never be replaced by mechanical equipment. Learn the practical end of the business the end that made men like Ford and Chrysler, leaders of the industry With 25 million autos on the roads of the nation everyone needing service and repair—the demand for trained, highly skilled, auto experts is greater than ever. It's all made easy and quick for you at McSweeny's. It's the sure way to a business of your own.

Hundreds of McSweeny trained men own successful Auto Agencies and Service Garages are independent [illegible] prosperous [illegible] McSweeny training [illegible] management of businesses like this

Learn by Doing No Books—No Lessons

You get practical, individual, shop-work training at the McSweeny school. No books to read—no dry lectures to listen to You work on real equipment, with real tools. You do the actual work in each branch of the trade, with expert instructors at your elbow to guide you, show you how to do the job right **No previous experience needed . . .** just a liking for mechanics and ambition for success . . . and you are assured of a prosperous future 50,000 McSweeny trained men attest to the advantage of McSweeny training

Money Back Guarantee

If, after completing my training, you are not satisfied, if you are not qualified to accept a big-pay job, your tuition will be refunded. You take no risk—no chances.

SPECIAL TUITION OFFER

Right now I have a surprise offer that makes it amazingly easy for you to get this training. It's your one big chance to get out of the low pay rut into a trade that can bring you big money and independence Write me now. I'll send you all particulars of the most sensational school offer ever made in America—an offer that makes it possible for any man any where to get this training.

TRAIN FOR THESE JOBS

McSweeny training fits you for these positions. Jobs waiting in the auto business for men who know

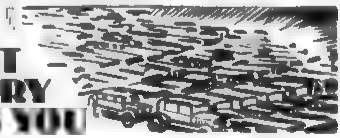
- General Auto Mechanics
- Garage Managers
- Bus and Auto Transportation Experts
- Service Station Owners and Operators
- New and Used Car Dealers and Salesmen
- Trouble Shooters
- Auto Electrical Experts
- Battery Service [illegible]
- [illegible]
- Tractor Operators and Service [illegible]
- Aviation Motor [illegible]

Big Auto Book FREE

My big auto book brings you all the particulars of this great school shows you every step in the training that starts you on the road to become an expert in this greatest of trades. Just send your name and address or mail the coupon My surprise tuition offer will be mailed with catalog. Don't wait—offer limited WRITE NOW!

McSWEENY SCHOOL
CLEVELAND, OHIO

AMERICA'S GREATEST INDUSTRY NEEDS YOU



Mail This Coupon for FREE Book

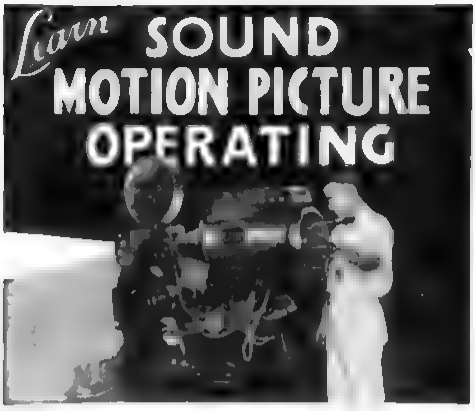
J. H. McSweeny, Pres.
Dept. A-11-5, Chester at 30th St.,
Cleveland, Ohio

Without cost or obligation, send me your big **FREE** book on **AUTO MECHANICS** and full details of your Special Low Tuition and Surprise Offer

Name.....

Street.....

Town .... State Age



Men Needed NOW!

Earn up to $125.00 a week in this Fascinating New Field!

4 to 6 Hours Work a Day

You've seen how men who got into the automotive, electrical and aviation industries, when they were uncrowded, have doubled and tripled their earning power. NOW—the same golden opportunity is offered to YOU, in a brand new, fascinating field, Sound Motion Picture Operating! More than 5000 theaters in the United States still to be wired for sound—more than 10,000 trained men needed to operate this delicate sound equipment, and new theaters building every month! MEN—here is a real chance to get out of a dull, hopeless job and step into the big pay field with only 4 to 6 hours of entertaining work a day, 52 weeks of the year—no layoffs or salary cuts, and a genuine future ahead!

Quickly Train Yourself With C. O. T. A.

The California Operator's Training Association is situated in the capital of the Motion Picture Industry, Los Angeles. It has successfully trained men in all parts of the world to qualify as Expert Operators in leading theaters. The C.O.T.A. is the only training division of any labor organization in the world serving this field. This means full protection for YOU while you are learning, and after you graduate and become an Expert Operator. Right in your own home, during spare time, The C.O.T.A. will quickly prepare you for actual work on the latest RCA and Western Electric Sound Equipment. Previous experience unnecessary.

Low Tuition Cost With Special Offer

The C.O.T.A. is so positive it can successfully train ambitious men for this well-paid field, you need only pay less than half of the low tuition cost—pay the rest after you are making money as an Expert Operator. This offer for a limited time only!

Mail Coupon for FREE BOOK

Get all the facts! Learn what others have done. Read the complete details of C.O.T.A. Training and our SPECIAL OFFER. Write today!

California Operator's Training School, Dept. A1,
103 North Rowan Ave., Los Angeles, Calif.

Send me full details of your Sound Motion Picture Operator's training and details of Special Offer.

Name .....

Address .....

(Write or Print Plainly)

ANDY'S SHOP MAIL BOX

(Continued from page 36)

jork, from the pretty town of Wellsville. And Clair, old chicken, please don't sir me.

Wellsville, N. Y.

Dear Sir:

I have been a constant reader of your Mag. ever since it was first put on sale. I don't think there is another Mag. on the market that will compare with it, especially the "How to Build" department. To prove that I do think quite a lot of it I am sending a couple snaps of the plane which I built from the plans published a while back.

I have a landing gear of my own design on it that sure works great. The ship sure flew and handled great until I landed it in the telephone wires. Now I am in need of one right wing, otherwise it is still in pretty fair shape.

Sincerely,
CLAIR CORNWALL.

I admit that we have some good artists working on our crew. As a matter of fact, the Gang that gets out this magazine are the most talented bunch of 20 year olds (ah, maybe a little older, but the nigh side of 30) that I ever see. And it does me good to know that Doug Rolfe, who was with the Royal Flying Corps of England in the war, and Norm Saunders, who was in Knee Pants, are getting some of the recognition they deserve. Norm is a cover artist of no mean caliber. He did the Sun Power cover on this issue, and can bat out a wash quicker'n I kin spit. And much prettier.

Tump -ta- na- na a a a!
Attend ye:

Barrytown, N. Y.

Hello Andy!

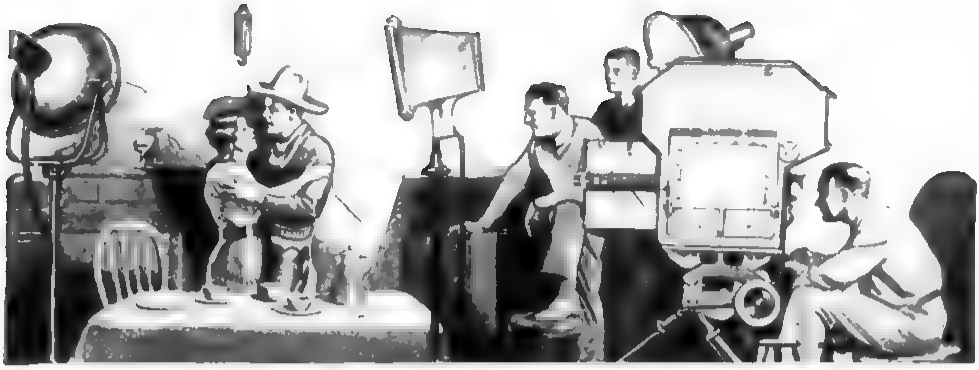
This is the foist woid from me but I hope not the last. I've been wondering about an addition (you note I do not say improvement) to the Ramsey Flying Bathtub. I wonder:

Could you enclose the tail outrigger as I have shown on the enclosed drawing? The page is from the 1932 Flying and Glider Manual. The addition would make it a cabin ship and give you more baggage space. And it might increase the speed. And now, some comments on your magazine:

N. Saunders and D. Rolfe are sure good on plane drawings. Are their drawings all "wash drawings"? I have a collection of airplane scrap books 8 (eight) in number, and six of the books have only plane pictures in them and they now total 1100. And then one other book has only scale outline drawings, totaling 240. In Book No. 8 I have pages from your magazine by N. S. and D. R. The magazines or books are the result of three years' work.

Yours for Happy Landings,
A. A. ASKEN, JR.

That clears the deck, men. Shoot me yer observations and fence post filosophy fer inclusion in th' next issue as I am going to enlarge this department considerable. I've got a scrap book myself. I lean a little partial to boats and have quite a collection of Rabl, Farmer, Hacker designs. Be seeing you!



LEARN RADIO-TELEVISION TALKING PICTURES in LOS ANGELES

Get your training in California where many of the famous Radio Stars make their home—where the great American Television Laboratories are located—and hundreds of trained Sound Engineers and Mechanics are employed in the Talking Picture Studios, Broadcasting Stations and Theatres of Hollywood and Los Angeles.

Railroad Fare Allowed to California

For a limited time we are allowing coach railroad fare to Los Angeles from any point in the United States. This is included in and deducted from your tuition, so the trip costs you nothing extra. Take advantage of this opportunity to visit Los Angeles and Hollywood, and prepare for a good paying Radio job at the same time. Mail coupon for full details.

PRACTICAL SHOP TRAINING

At the Oldest Trade School in the West

For over 25 years National has been training men by the practical shop method. Over 20,000 ambitious men from all over America have come to National for their training. You'll find National graduates working in the famous Studios of Hollywood, in Talking Picture Theatres, great Broadcasting Stations, for Radio Manufacturers and Dealers, while many have gone into the Radio business for themselves and are making big money as their own boss. What they have done, you should be able to do! Mail coupon for proof!

MANY JOBS WILL BE OPEN

10,000,000 Radio sets to be constantly serviced! 600 Broadcasting Stations employing trained Operators and Mechanics! 10,000 Theatres equipped for sound and the job only half done! Eight stations already sending out regular Television programs! New jobs will be opening up every day—hundreds of golden opportunities for the trained man. And you can prepare for them in 4 months at National!

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Many Earn While Learning

When you've finished National Training—four months of practical Shop Work in the great National Television, Talking Picture and Radio Shops,—then National's Employment Department will assist you in every possible way to get the job you want. And if you're short of money, after paying your tuition, we will gladly do all we can to help you get part time work to pay your room and board while at school.

MAIL COUPON FOR BIG FREE BOOK

Get all the facts! Mail coupon below for our Big Free Book, telling all about National's famous Shop Training and the many jobs opening up in these fascinating fields. No cost or obligation! Just mail the coupon.

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Los Angeles, California.

Please send me your big new Free Book on Television, Talking Pictures and Radio, and full details of your Railroad Fare offer.

Name_____

Street No._____

City _____ State _____

SHOP BLUEPRINTS

for the HOME WORKSHOP FAN

Every plan advertised on this page is a GENUINE blueprint. Do not confuse them with cheap substitutes printed on a printing press. These prints are faithful, actual-size reproductions of the draftsmen's original drawings. They'll survive rough usage in the workshop. Prints are large size, easy to scale off dimensions. Shipped postpaid at quoted prices.

BOATS

GANNET—Ford-Powered

A deservedly popular boat plan. A 24-foot cruiser, powered with Model T Ford motor, driving her at around 15 m.p.h. Uses V-bottom hull, easy for amateur builder. Straight sides easy to plank. Bunks for two; plenty of room for provisions and duffle.
Price of prints **$2.00**

DOROTHY—A Cruiser

Primarily a power boat, designed for cruising economy, not speed. Good for 9 miles an hour with a 10 h.p. marine motor. Ford can be used if desired. Dorothy has a sail if the motor quits. She's 24-foot, plenty of cabin room for two or more; a real deep-water performer. Prints **$2.50**

PUNKIN' SEED

A small outboard racer, extremely simple to build. Cleans up in B, C, and D classes everywhere. Strictly a speedboat—easily portable. Prints **75c**

WANDERBOAT

An outboard runabout and cabin cruiser in one, light enough to move on a trailer. Good for 32-35 m.p.h. with a large outboard motor. Canvas covering which can be put in place in a jiffy gives you a weather-tight cabin for overnight stops. Prints **$2.00**

WHIZZER—Air-Driven

A speedboat driven by an air propeller and a converted motorcycle engine of one or two lungs. Lots of fun and plenty of speed. Prints **50c**

KATUSHA—A Cruiser

Here's a big little 19-foot cruiser with a big double bunk and stern cabin. You can build her for about $100. Ultra modern, with stern drive engine. About the right size to tow on a big trailer for parts unknown and real adventure **$2.00**

WINK—A Race Boat

Here's a 125 cu. in. race job, over a dozen of which have been built. It is really an inboard motored hydroplane in the outboard size class. Plenty of speed; 40 miles an hour, and not hard to build. Very pretty **$2.00**

TUBBY—A Sailing Scow

A 12-foot sailing scow, just the thing for boating fans looking for something simple to construct. Flat-bottomed, with leeboards—the acme of simplicity to build. Your choice of two sail plans—you can use her as a rowboat, too. Price of prints **$1.25**

FORD SPEEDSTER BODY

Racing body for a Model T Ford or similar chassis. Wooden frame covered with chicken wire, then a layer of cotton batting held down by Fabrikoid (imitation leather) covering, makes this a ritzy-looking streamlined job. Costs but a few dollars to build.
Price of blueprints **$1.00**

CAMPING HOUSE-TRAILER

Just the thing for vacation-time—a trailer with beds and household equipment, with a collapsible canvas roof and sides which fold up when not in use. Four or more can sleep in her. Prints **$1.00**

TRAILER POWER PLANT

A sturdy auto trailer which can also be used to transmit power from the car to run machinery, simply by turning trailer upside down and backing it up to rear wheels of car. Blueprints **50c**

SCISSORBILL ICEBOAT

Sailing iceboat, large enough for 6 passengers. Can be built for from $5 to $20, depending on available scrap materials. Prints **50c**

LIGHT AIRPLANES

PIETENPOL AIR CAMPER

The country's most popular home-built plane. Carries two passengers, powered with Model A Ford motor. High wing monoplane. Cost of construction, including motor, well under $500. Blueprints show both wood and steel tube fuselages, and give motor conversion details. Hundreds of these prints have been sold with complete satisfaction. Price of prints **$7.50**

PIETENPOL SKY SCOUT

A mate to the Air Camper. Single place, powered with Model T Ford motor. Cruising speed, around 75 m.p.h. The most satisfactory light plane with this type of motor. Price of blueprints **$4.00**

RAMSEY SPORTPLANE

A "fool-proof" light plane, carrying two passengers side by side. Powered by Aeronca motor, or one of similar horsepower. Steel tube construction. Low landing speed, extreme ease and safety of handling characterize this ship. Price of prints **$4.00**

Modern Mechanics and Inventions Blueprint Department,
529 S. Seventh St., Minneapolis, Minn.

Gentlemen: Enclosed please find $ _____ in payment for blueprints of _____
to be shipped immediately, postpaid, to the address given below.

Name _____
(Please PRINT plainly)

Street _____

City and State _____

(Orders totaling $2.50 or over sent C.O.D. if desired, when one-third payment accompanies order.)

At Last Aluminum can be soldered!

ALUMAWELD ALL METAL SOLDER

will repair any metal

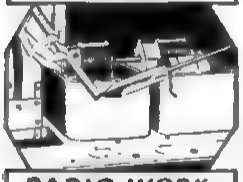
ALUMINUM · POT METAL
STEEL · CAST IRON ETC

Ten Times as strong as ordinary solder

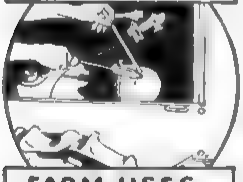
THE news is out at last! An all-metal solder has been discovered! It will repair aluminum or any alloy. It will repair pot metal and pewter. It will hold on cast iron and steel with a tensile strength of 12,000 lbs. to the square inch.

The solder is called Alumaweld—and it works like magic. You can take two pieces of sheet aluminum, hold them over a flame for a few seconds, and you have a joint that CAN'T BE BROKEN. The aluminum will tear to bits under your pull, but the joint is PERMANENT!

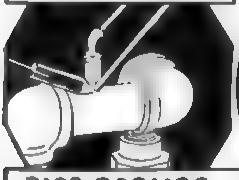
AUTO SHOP



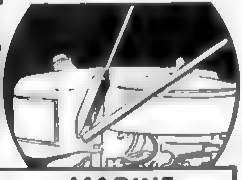
RADIO WORK



FARM USES



PIPE REPAIRS



MARINE

Alumaweld REPAIRS

Crank cases, burst water jackets, vacuum cleaners, washing machines, radio sets, auto bodies, farm implements, pots and pans, aeroplane engines, outboard motors, steam radiators, water pipes and steam pipes, and all general machine shop or sheet metal repair.

It will repair ANY METAL easily, perfectly and lastingly.

Alumaweld can be used by anyone without experience. It is applied with an ordinary soldering iron or blow torch—or over the flame of your own gas stove.

Already some of the very largest concerns in the country are using Alumaweld. Motor car manufacturers, aeroplane companies, electric and gas companies, sheet metal works, foundries—all of these and many more—find it absolutely necessary.

No matter how you use metals—whether it is in your business or your home work shop—you will want some Alumaweld. It does a 100% guaranteed job.

Complete kits of Alumaweld, containing seven good sized sticks of solder, a bottle of flux, a tempered steel cleaning brush, two aluminum strips for test purposes, and complete EASILY FOLLOWED DIRECTIONS sell for $1.00.

Send for a kit and solder the two strips of aluminum together according to directions. If you can tear them apart, before you tear the aluminum, we will refund your money. Alumaweld does all metal work perfectly. Order a kit and let it do this work for YOU.

Use the coupon below

AGENTS! DEALERS!
MAKE BIG MONEY SELLING ALUMAWELD

Get in on the ground floor. Our agents are making up to $30 a day selling Alumaweld. Be your own boss. Every home, factory and repair shop NEEDS Alumaweld. It sells on sight. 100% profit to you. Send $1.00 for a complete kit. Try it out. If you MEAN BUSINESS we will grant you territory [illegible] you lead from our advertising [illegible] and circulars for distribution. Don't delay. Alumaweld franchises are VALUABLE. They'll go FAST. Mail the coupon TODAY.

ALUMAWELD COMPANY, Dept. 1A.
710 E. Broadway, Glendale, Calif.

Gentlemen: Mail me immediately a complete kit of Alumaweld, containing seven good sized sticks of solder, a bottle of flux, a tempered steel cleaning brush, two aluminum strips for test purposes, and complete easily followed directions, for which I am enclosing one dollar. If for any reason I am not satisfied you agree to refund my money without question.

☐ Check here if you want agent's proposition

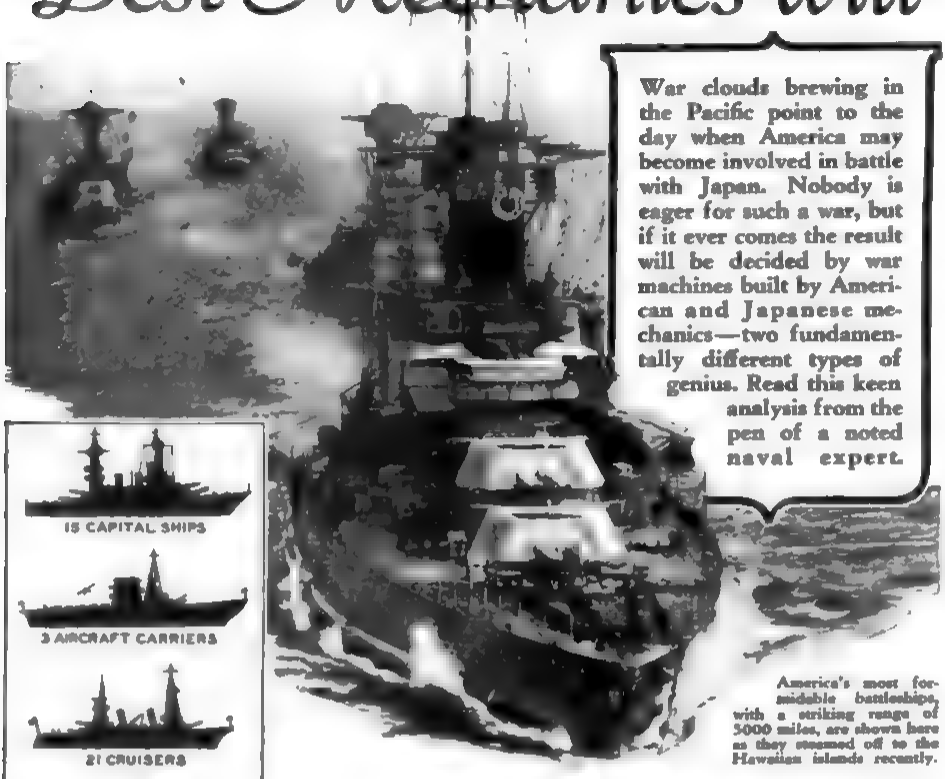
Name

Address

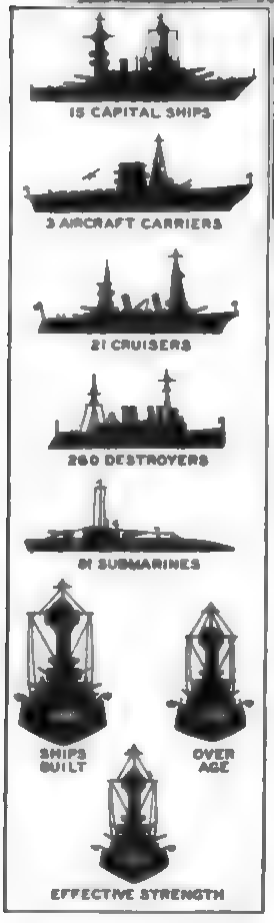
Town and State

Best Mechanics will

War clouds brewing in the Pacific point to the day when America may become involved in battle with Japan. Nobody is eager for such a war, but if it ever comes the result will be decided by war machines built by American and Japanese mechanics—two fundamentally different types of genius. Read this keen analysis from the pen of a noted naval expert.



America's most formidable battleships, with a striking range of 5000 miles, are shown here as they steamed off to the Hawaiian islands recently.



U. S. NAVAL STRENGTH

by **LIEUT. JOHN EDWIN HOGG**

U. S. Naval Reserve

AS THESE lines are written international diplomats are gathered together at Geneva. They are assembled at the world's first general disarmament conference, ostensibly to work out a plan for preventing armed conflicts between nations. The God of War looks down from a neighboring planet upon a world bristling with every possible device for killing the greatest number of people with the least effort. And in Shanghai war rages between Japanese and Chinese troops.

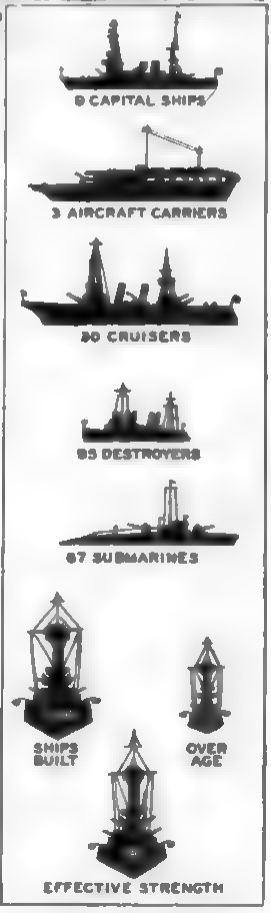
Japanese Have Efficient War Machine

Japan is today the most disturbing element in any consideration for world peace. She is the world's last, great, militarist monarchy. Monarchies have always been, and always will be a threat to peace-loving, democratic neighbor nations. Japan now possesses the best, most efficient, and most highly organized war machine that the world has seen since the great German war engine of 1914.

She is ruled by a small group of war lords, who by systematic propaganda and a subsidized public press, may at any time hoodwink the Japanese population into any military conquest the leaders may see fit to dictate. Already the Japanese military aggression in China threatens to involve Soviet Russia. International treaties are in jeopardy. The Policy of the Open

Win if U. S. FIGHTS JAPAN

Here is Japan's most modern aircraft carrier, the "Kawa," which accommodates a fleet of 110 planes. Note how Japanese mechanics have placed smoke stacks running lengthwise of the ship. U. S. aircraft carriers have stacks and masts projecting up from deck, at one side of ship. Diagram at right shows effective strength of Japanese Navy to be slightly greater than United States naval power.



JAPAN'S NAVY

Door in China, to which the United States is as definitely committed as we are to the Monroe Doctrine, may easily become a mere scrap of paper.

The whole situation is one of grave uncertainty that may easily lead to world-wide complications. Just as a great forest fire usually starts from a single match, the embers of Shanghai may light the fuse to plunge the United States into another foreign conflict. Such is the possibility, unless the Japanese statesmen are correct in their apparent belief that the rest of the world is too busy with its own troubles to take any notice of what Japan does to China.

Japanese Expansion Requires More Land

There is, of course, a Japanese side to the story. The Island Empire consists of a land area of 261,832 square miles, or slightly less than our state of Texas. Less than one-fifth of Japan is arable land, and largely poor, volcanic soil at that. Yet she must feed and clothe a population of nearly ninety millions of people. Japan is appallingly over-populated. She cannot begin to provide food for her multitudes. Yet the rest of the world has slammed the door in the face of every Japanese attempt to colonize elsewhere.

How Japanese and U. S. Interests Clash

Territory acquired by Japan since 1865, the year in which Commander Perry of the American navy opened up the country to western civilization and dreams of Pacific dominance, includes the island of Formosa, half the island of Saghalien, Korea, and lately Manchuria, richest prize of all. Most recently Japan launched her attack on Shanghai, ostensibly to protect Japanese interests in China, and to inform the world that Japan courts no competition in China.

Japan is admirably situated to nose American industry out of Chinese markets. She could sink our commercial ships and tell us to take our commerce off the Pacific ocean, and about

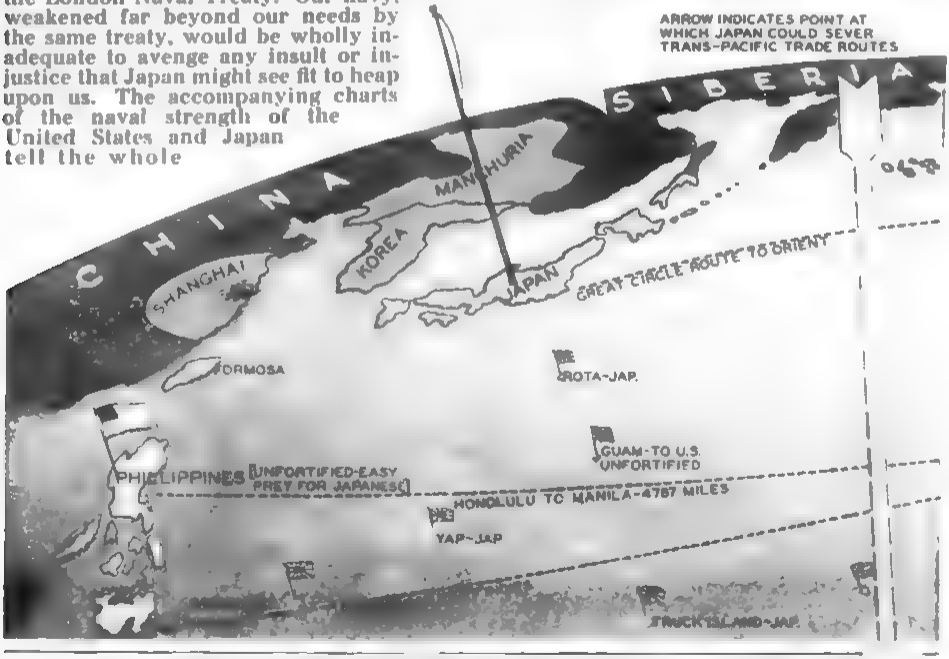
Chinese, With Few Modern Weapons, Prove Formidable Enemy to Japs

With only a few machine guns, rifles, antiquated field pieces, and practically no air force, Chinese soldiers at Shanghai have put up a surprisingly effective defense against the Japanese who are armed with the latest weapons and airplanes.

all we could do about it for at least two years would be to write notes of protest.

If Japan were to declare war upon us today we wouldn't have a Chinaman's chance of holding the Philippines or the Island of Guam. This is for the reason that those two strategic positions have been rendered practically defenseless under the terms of the London Naval Treaty. Our navy, weakened far beyond our needs by the same treaty, would be wholly inadequate to avenge any insult or injustice that Japan might see fit to heap upon us. The accompanying charts of the naval strength of the United States and Japan tell the whole story. But here, we cannot even compute sea power in mere terms of comparative tonnage without being led to false conclusions. There are a lot of other factors entering into the situation that tend to discount what naval strength we still possess.

Losing Guam and the Philippines would only be part of our misfortune if we were



This map presents a graphic picture of the Pacific situation as it affects the United States and Japan. Yellow areas on this page show regions in which Japan dominates. The Philippines, under American protection, are shown in yellow tint, since they could easily be captured by Japan in case of war. Note distance from American naval base at Hawaii. Note increased areas of Japanese dominance in Manchuria and Shanghai.

Japanese marines fighting in Shanghai streets. The Japanese have modeled their army after the German system, but have not succeeded in copying the Prussian brains that developed the model. Japanese fight fanatically, but lack imagination.

to become involved in a war with Japan. We would also probably lose the Aleutian Islands, and would see them taken over by the enemy as bases from which to raid our Pacific commerce with aircraft and submarines. We'd be fortunate indeed if we didn't lose the whole of Alaska during the first two weeks of such a war, and with Alaska in the hands of the Japanese we'd probably see air raids carried out upon such American cities as Seattle, Portland, Spokane, Butte, and Anaconda. (The latter two cities are our major sources of copper.)

The Japanese battle line of nine capital ships would not be a serious menace to the present American sea forces if the combined battle fleets of the two nations might come together early in the war to fight a decisive battle. If this were to happen it is entirely possible that the American fleet might destroy the Japanese fleet. Such a circumstance would lay Japan wide open

Hawaii, America's Pacific naval base, is practically impregnable to Japanese attack, and would serve as base of operations in case of war. But note the distance the fleet would have to travel to reach Japan. Yellow arrow shows where Japan could dominate trade routes any time she chose. If Japan would capture Aleutian islands, off Alaska, she could raid Pacific coast cities from the air—on the other hand, United States could use same islands as base for Tokio bombing.

A typical section of Japan's air fleet. The first plane at the left is a French Nieuport, the five beside it are British-built Avros. The large ship in foreground is built by Japanese from French designs. Note that none of these ships represent any original contribution by Japanese mechanics, who are mostly content to copy various foreign designs.

Japanese flyers loading a bombing plane. Note small size of bombs, compared to 2000-pounders carried by U. S. bombers. This Japanese-built plane uses a French Hisso motor.

to every form of attack, and would speedily force her to sue for peace. But here another consideration creates a disturbing factor.

The exigencies of the situation would certainly demand that we carry our campaign into the western Pacific. We would have to re-capture Guam and the Philippines. In attempting to do all this we would have no naval bases nearer the scene of action than Hawaii. Thus, the value of Japan's navy would become very similar to that of the German navy during the World war. As long as Japanese fighting craft could operate unchallenged in the western Pacific, they could effectively throttle our trans-Pacific commerce.

In that event the conflict would simmer down to a long, drawn-out campaign of "steam and hunt," with an occasional battle between a few ships until one side or the other would suffer defeat. The average American who has lived his life in an inland state probably has no conception of the enormity of such a task. But ponder the fact that the Pacific Ocean consists of 97 million square miles of water—nearly half the surface of the entire earth, and we have an idea of the job.

7000 Miles Across Pacific

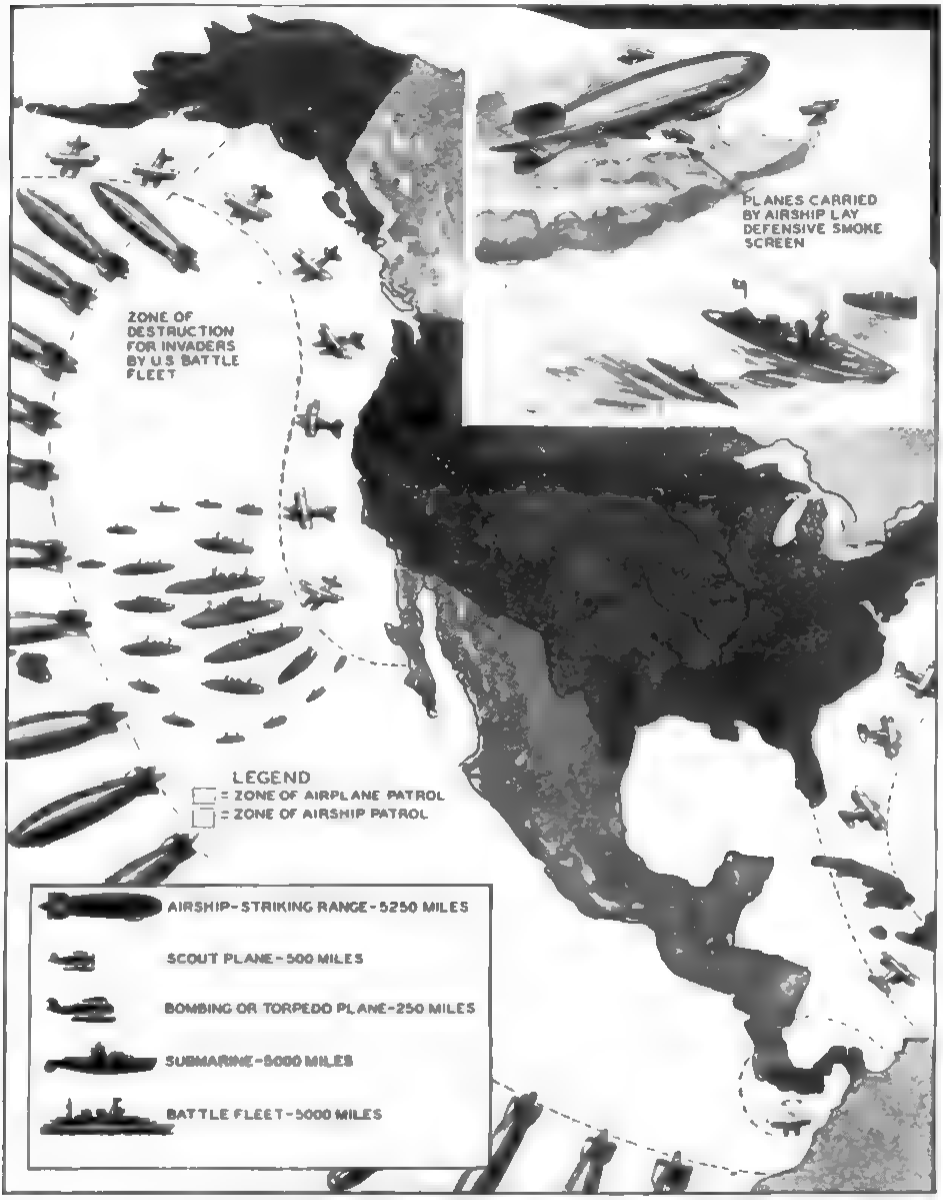
The re-capture of Guam and the Philippines would involve sending our battle forces on a 7000-mile drag across the Pacific, encumbered with a huge train of slow-moving transports, supply ships, oil tankers, etc. This would be a gigantic enterprise—beyond the scope of any overseas naval offensive in history. The task of keeping the lines of communication open and of protecting the huge convoy against enemy submarines, cruisers, and aircraft, would be but another detail of the situation facing the American Commander-in-Chief.

He'd also have miscellaneous other worries such as protecting the Hawaiian Islands, keeping the enemy away from our home shores, and guarding the Panama Canal. Obviously, our present navy would be so hopelessly inadequate for such a task that the first two years of a possible war with Japan is sickening to contemplate.

Distance Complicates Naval Strategy

These considerations, however, would not be the worst of it. As the American convoys advance across the Pacific the danger from raids by enemy submarines, cruisers, and aircraft, would become increasingly great. Then, if our fleet and land

Map Shows Defensive Value of Airships as Developed by U. S. Navy

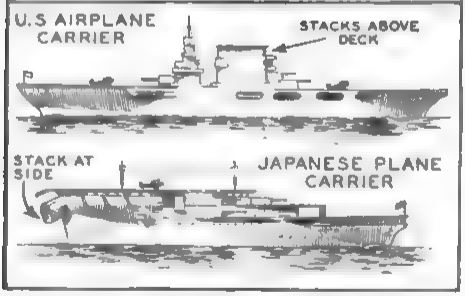


The U. S. Navy leads in the development of the dirigible airship. We now have the Los Angeles and Akron, and a sister ship to the latter is being built. This map shows how a fleet of such dirigibles could fulfill their mission as scouts, warning of the approach of an enemy fleet while it was still thousands of miles off our coast. The Akron carries its own fleet of airplanes which could lay smoke screens to cover its retreat in case of enemy attack. Note long striking range.

forces succeeded in re-capturing Guam and the Philippines our troubles would just be getting nicely started.

Due to our having been so badly worsted in previous "disarmament conferences" there isn't a dry dock west of Hawaii (except in enemy territory) that could accommodate a damaged battleship or airplane carrier. Our fleet, if based on Manila Bay would be within striking distance of air raids from the Japanese mainland. And, to make the situation still worse, both our land

Here is a type of war weapon which the Japanese do not possess. The U. S. S. Patoka has a mooring mast as mother ship for dirigibles. It is in the development of our air fleet that superiority of American over Japanese mechanics is most strikingly demonstrated.



Above is U. S. S. Saratoga, one of our three airplane carriers. Note smoke stacks at side of ship, and compare with longitudinal stacks used by Japanese, shown on page 43.

and sea forces would still be dependent upon the shores of California, 7000 miles away, for supplies of fuel, ammunition, and the bulk of its provisions.

If such a war were to break out today we'd be fortunate indeed if our present forces might be able to keep the Panama Canal open and the enemy off our home shores. Our one and only great good fortune would lie in the fact that Hawaii is under the American flag and is our strongest outpost of naval defense in the Pacific. The Island of Oahu upon which our principal naval establishment is located is considered virtually impregnable.

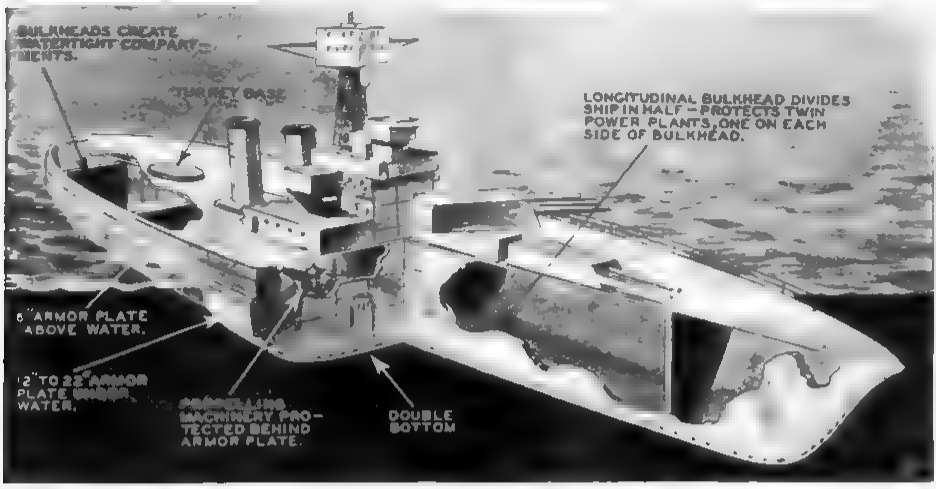
Mechanical Resources Will Decide

There is, however, another side to the dismal picture of a possible war with Japan that would ultimately spell defeat for the Mikado's Empire and victory for America. This, of course, is assuming that the enemy didn't catch us napping to knock us out during the first few weeks of the war. The next war will be a war of machinery, and the nation possessing the best mechanics will win. America has the mechanics. We also have the necessary natural resources, and no other nation possesses both in similar abundance.

If we could stave off defeat temporarily in a war with Japan, and we undoubtedly could, our military and naval strength would immediately begin to increase. In the course of 18 months or 2 years we could throw a force against the enemy to overwhelm any nation or alliance of nations foolish enough to invite such a disaster upon themselves.

Mechanical Genius Concentrated in U. S.

By far the vast bulk of the world's best mechanical and scientific genius is now assembled in America. Not all of it is native born. America has been importing such talent for many years from every other nation that could produce it. Let any other nation produce a great inventor, an extraordinary chemist, or a skilled technician in any line—and what happens? American industry usually gets him. He finds a better



Diagrammatic view of construction features of a modern battleship, largely developed by American and British designers. Note placing of thick layers of armor plate beneath water level. Longitudinal bulkheads separate ship into halves, so if one power plant is destroyed the other carries on. Shells have to penetrate armor plate and explode inside vessel to do damage.

market for his talent here. We hire him and soon convert him into an American citizen.

The list of inventions and scientific discoveries originating in other countries is not very impressive. To be sure, there have been some, mostly of German, British, or French origin, but they are few and relatively unimportant compared with the contributions to human progress made by Americans, or By men of foreign birth who are now American citizens. This constant hiring of the best brains of Europe, and of every other country by America has long been cause for alarm among European statesmen, but apparently there is nothing they can do about it. American money talks to the man who has brains for sale, and all the fine appeals to his patriotism don't lift the curse of poverty for him!

Japanese Copy Western Progress

In this respect Japan is tremendously handicapped. Her entire civilization is a composite counterfeit of the most progressive ways of Europe and America. We may scan the list of great inventions, great scientific discoveries, and the like, and not one do we find of Japanese origin. The germ cells of men like Fulton, Edison, Steinmetz, Marconi, the Wright Brothers, Maxim, Colt, Holland, Millikan, and a list of Americans or naturalized Americans that reads like a city directory, were apparently bred out of the Japanese people during their centuries of feudalism, if they ever existed.

Give the Japanese a fine Swiss watch and they'll make you a cheap imitation of it. Give them an American automobile and they'll build an automobile that looks exactly like the original, but not as good. Let them get their hands upon anything and they'll counterfeit that article. They'll work like bees at any task they undertake, but when it comes to originality of thought along mechanical or scientific lines—there apparently isn't a brain cell working in the whole of Japan!

Japs Lack Mechanical "Feel"

To us they are a strange people—brilliant, industrious, thrifty, cunningly clever in many respects—and tremendously backward in others. Only about one Japanese in ten thousand can ever be taught to fly an airplane. It often takes years to make a very poor automobile driver out of an average Japanese citizen. Their patriotic devotion is a form of fanaticism not even approached in some forms of religion.

If we are forced into a war with Japan, the President, upon the very day war is declared, will undoubtedly be empowered to draft manpower, labor, and capital. The entire nation would be speedily drafted to the sole task of winning the war. Civilian armies would be drafted to grow the crops, and every industrial plant capable of conversion for the production of war equipment would be commandeered by the government. Motor truc't factories would soon be turning out tanks. Automobile factories would begin building airplanes. A thousand small machine shops would turn out small arms and munitions. Chemical plants would concentrate upon the manufacture of explosives and poison gas. Every shipyard would be turning out battleships, cruisers, destroyers, submarines, transports, and supply ships.

(Continued on page 174)

Tones of New Stringless Cello Generated by Electricity

The electrical unit which controls the tone and volume of this stringless cello is contained in the sound box.

AN ELECTRIC cello without strings capable of producing tremendous volume and exquisite tone has been invented by Leon Theremin, who is shown in the photo on the left demonstrating how his new instrument is played.

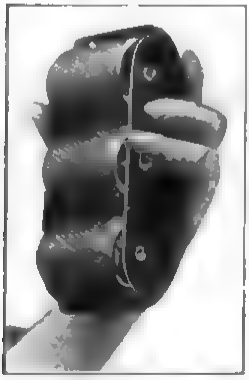
Tones are varied by running the fingers of the left hand up and down the heavy black line which replaces the strings, while the right hand works the pump to control the volume.

An external oscillator, amplifier and loud speaker are used with this cello and the tones are generated by the oscillating tubes in the instrument. As the fingers are run up and down the black line, under which a coil is concealed, the player varies the capacity of the circuit which alters the frequency, or pitch, of the oscillating tubes.

Watch Keeps Time in Reverse

PAUL WERTHS, San Antonio, Texas, jeweler, has completed a watch which keeps exact time—and runs backward. Everything in the watch is reversed. The numbers on the face are all in reverse order except the six and the twelve. The hands and minute hand move counterclockwise.

Brush Gives Clothing New Life



Tiny steel points on the rollers go over the worn, matted cloth, raising and combing the pile.

A NEW finish is put on your worn clothing by this brush, shown at the left, which employs the same pile-raising system as that used on the cloth when it comes from the loom.

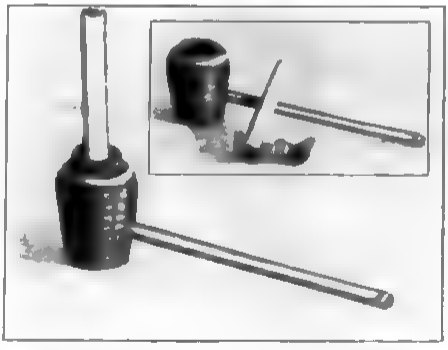
It consists of a series of three rollers covered with tiny steel points which roll over the clothing shaking up the fibres which have become worn down and matted by wear.

Four Foods For Healthy Children

THE regular inclusion of milk, eggs, fresh fruit and a reasonable amount of meat or fish in a child's weekly diet results in a greatly increased resistance to disease and a better health, according to Dr. Helen Mackay, physician of the Queen's Hospital for Children, London.

The most important item is milk. Children up to five years of age should have at least one pint a day, not only because of its food value, but also because milk contains mineral salts and other substances necessary for the child's growth and health.

Cigarette Holder Filters Smoke



Cigarette is held by the split cork as illustrated here

TO MAKE a cigarette holder that filters and cools the smoke, procure a small size corncob and a close-grained cork. Trim the cork so that it fits tightly into the bowl with about ¼ inch of the cork projecting to make removal of stubs easy.

For a filter and cooler, place a small cotton wad and menthol crystals in the bowl. With a red hot iron burn a hole through the center of the cork to hold the cigarette. Then cut the cork in half, place the fag between the corks and insert in the pipe.

Rubber-Tired Rail Bus Outruns Trains

Equipped with pneumatic tires, this bus takes to the railroad tracks in England and travels faster than a locomotive or auto.

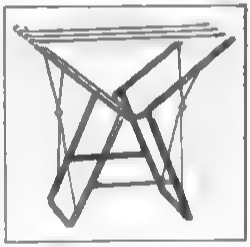
FROM England comes this new mode of overland transportation; a pneumatic-wheeled automobile that travels on train rails. The road-rail car, as the above photo shows, is a tourist sight-seeing van drawn by a traffic bus motor. The original wheels have been removed and replaced with pneumatic wheels to fit the train rails.

The new car rolls along under its own power just as any other automobile and is claimed to be much faster than the present day locomotive. The passengers are comfortably seated in the van which is free from the rocking and rolling of the ordinary highway bus.

The operator has little difficulty in running the machine and isn't confronted with the hazards of meeting and passing other vehicles.

Folding Chair Also Serves as Pillow

TOURISTS, campers and picnickers will find the little folding seat shown on the right a mighty convenient accessory. It weighs but two pounds and measures only 9 by 12 inches when closed. It can be folded up to serve as a pillow or a chair and will support 250 lbs. Small size when folded permits it to be carried under your car seat.



Camp chair supports 250 lbs.

Build Novel Sidewalks Around Your Home, Creating Your Own Design

IF YOU have occasion to lay concrete sidewalks about your home, you will find it gratifying to get away from the monotony of uniform blocks.

Design in walk is imprinted from pattern on wood slab.

Construct a wood slab of such size that will completely cover each rectangular section of the walk. One surface must be smooth and free from knot holes and protruding edges. On the opposite side, near opposing edges, fasten handles so that the slab can be lifted by two persons.

With strips of wood of square cross section, work out whatever design you wish to create in the walk. The strips should measure about ¼ to ½ inch at the maximum. The smaller is preferable.

After a section of the walk has been poured and smoothed out, carefully lower the slab on it with the design side down. Let it rest for about twenty minutes, then carefully lift it off. The clear imprint should remain.

How American Team

by **JAY O'BRIEN, as told to Robert Dean**

Premier bobsled racing honors in Olympic Winter Games was won for United States a few weeks ago by the team of which the author of this article was a member. He explains here some of the thrilling tricks of this newly popularized American sport which offers as much excitement as riding a runaway meteor.

Want to get an idea of the thrills bobsledding holds for its devotees? Jay O'Brien says you get about the same sensation you would if you placed the Empire State building on top of the Woolworth tower, built an inclined sidewalk up to the peak, covered the sidewalk with glare ice, and then sped down it at breakneck speed on flexible flyer.

Diagram of 1½ mile Lake Placid bobsled run. Three spots marked with yellow crosses indicate curves which are especially dangerous.

UNTIL the Olympic Winter Games were run off at Lake Placid, New York, a few weeks ago, there weren't many folks in this country who had heard much about bobsledding as a sport. But today it is well established on the calendar of American outdoor activities, perhaps partly elevated to this position of favor by the achievement of the American team (of which I had the honor of being a member) in winning the Olympic Bobsled Championship cup in international competition.

This country is really the home of the bobsled, but in late years European nations have taken the lead in this typically American sport. The Scandinavian countries, Germany, France, Italy and Switzerland, have developed the sport to a high degree. There are over a dozen bobsled runs in Germany, and in the winter resort regions of the Alps the sport is perennially popular.

Only One Bobsled Run in U. S.

How does a bobsled team win an Olympic championship? I'll try to answer.

Bobsledding sounds easy—simply sit on a sled and steer yourself down hill. But there's much more to it than that, particularly in racing when split seconds are of vital importance. How to increase the speed of the sled while in motion, how to take curves, how to refine the sled's design to bring out the last ounce of efficiency—these are some of the elements the bobsled competitor must consider.

There is only one big bobsled run in this country. This is the Mt. Van Hoevenberg run at Lake Placid, designed by Stanislaus Zentzytzki, engineer of the famous Schreiberhau run in Germany.

Olympic Slide Is 1½ Miles Long

Mount Van Hoevenberg resembles a mammoth bas-relief against a mountainside. It is 2,350 meters or approximately 1½ miles long. The run maintains an average drop of 10 per cent, or 800 feet in the mile and one-half.

There are seven major curves, with stone and concrete beds, and eleven minor curves, with similar supports. The straightaways have an earthen foundation. The curves are covered with glare ice, which is a mixture of snow and water, while the

Won Bobsled Cup

Here's the United States number one team which won the Olympic bobsled championship by racing four times down the 1½-mile course in 7 minutes 55 seconds. From left to right, William Fiske, pilot; Edward F. Eagan, Clifford B. Gray, and Jay O'Brien, brakeman and author of this thrilling article. Note the bumper on front of sled.

How racers increase bobsled speed. Bodies are swayed back in unison, then thrown forward, imparting added momentum.

straightaways are dabbed with a thin frosting of snow so that the runners of the sleds can bite in and grip the slippery track.

I want to give you a rough picture of the scene before I describe to you what happens when a huge bobsled is released with its human cargo over this "greased lightning" trail.

A storage reservoir was built on the summit of Mount Van Hoevenberg and 9,000 feet of pipe led from it to give the run its ice coating. It required 25,000 gallons of water to make the slide navigable.

The compact ice formations, made possible by this artificial plant working in harmony with nature, provided the thirty and forty-foot curves which menaced the riders. The Zig-Zag bend and two hairpin turns were the most dangerous for the Olympic contestants.

Zig-Zag Curve Most Perilous

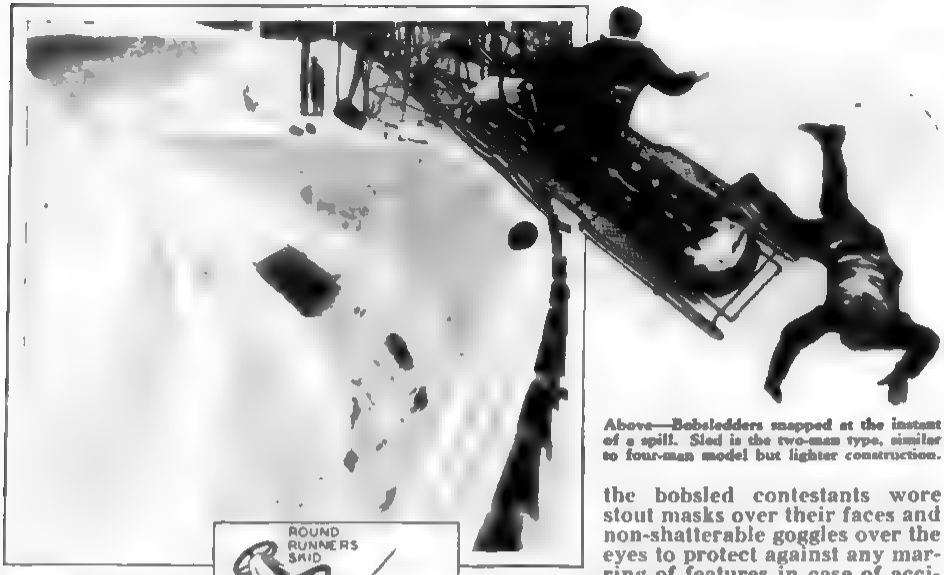
The most treacherous was the Zig-Zag curve. It was particularly hazardous because of the sudden change of direction, due to its reverse loop and because the sled was going at its fullest speed on reaching this point.

In order to avert being precipitated over the brink on the second bend our pilot, Billy Fiske, had to shoot the first twist of the "S" high and early, as we say. It is this quick change from a right to a left hand corner that challenges a pilot's skill to the limit. In rounding a curve all men on the sled must lean inward to counteract centrifugal force.

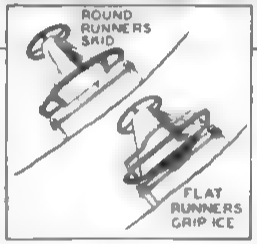
Spectators were kept informed of the sleds as they careened down the mountainside, disappearing for moments into depths of the curves only to whiz out again on a straightaway, by a telephone system that was installed along the line. Amplifiers told

William L. Fiske, driver of the championship bob team, is shown here holding the Olympic Cup which is the symbol of victory. The driver of a bobsled must calculate the behavior of his machine to a hair's breadth, knowing just how to round a curve at top speed without flying off the edge of the embankment. At a speed of 70 m.p.h., driver must be lightning-quick in reactions.

Empty Sled, Speeding Down Bob Course, Completed Trip Without Spill



Above—Bobsledders snapped at the instant of a spill. Sled is the two-man type, similar to four-man model but lighter construction.



Zig-Zag curve was the most feared on the Olympic run, owing to its sudden change of direction. To test condition of the run, an empty sled was sent down the course, as shown above. Diagram at right shows how flat runners helped American team to take curves without skidding sideways.

the crowds how the riders were negotiating the curves.

The bobsleds weighed 485 pounds. They were 12 feet long and low-slung to insure proper balance. At its highest point our sled was but 10½ inches from the ground.

Plenty of steel and iron reinforcing is used in the best bobsleds, which are mostly of wood construction. The brake is saw-toothed—a piece of metal extending across the entire width of the sled at the rear, with handles extending up at both sides so that the brakeman can put his entire weight on the brake in emergency.

Design Protects Against Accidents

Steering is by a wheel, like an auto, as a rule, though in some cases ropes may be used. Invariably there is a bumper of some sort on the front of the sled, and there is usually a hood over the steering post, not only for protective purposes, but to add a bit to the speed by streamlining.

Our wearing apparel consisted of headguards of the football type, heavy jerseys, gauntlets to protect the fingers in case of a spill, and hobnail boots. The rest of our garments were of very warm fabric and design.

In the matter of dress the individual taste of the sportsman usually prevails. Some of the bobsled contestants wore stout masks over their faces and non-shatterable goggles over the eyes to protect against any marring of features in case of accident. Football headguards were practically universal. Gauntlets in some cases had the fingers strongly reinforced to protect against possible broken bones.

Sliding Down the Woolworth Building

Let me give you some idea of how it feels to speed down a bob-run like a meteor. Just suppose that the Woolworth building could be superimposed upon the Empire State building and that we were at the very top of that composite structure.

Now let us suppose that a sidewalk banked with ice, and at some points slanted perpendicularly to the street, ran down the sides of this mass, with only an occasional straightaway to afford a brief respite.

You must also bear in mind that your course would be broken with curves which would almost double back on you. As you started from the top you would be catapulted down this lane faster and faster, taking curves to left and right.

You would shoot up on the banks and down again into the trough, going faster and faster until you were hitting 70 miles an hour. That's about the way I feel in a bobsled.

Bobsled Travels Close to Ground

The minutest swerve, a misgauged turn, a miscalculation of your speed in rounding a bend might easily mean going over the rim of the run to disaster.

Because of the fact that you're so close to the ground in a bobsled you get a more vivid realization of the speed at which you are traveling. The automobile racer and the aviator have their sensations of speed considerably dulled by the fact that they are higher above the ground.

If you're sitting on a bobsled shooting

Features of Championship Four-Man Bobsled Shown in Photograph

An excellent view of the cup-winning bobsled. Note the tubular bumper in front, the auto steering wheel, the back-strap for the driver, and the fabric hand-grips which the seated bobsledder is holding. The brake, at extreme rear, consists of a cross-piece of metal with saw-tooth edge.

down the side of a mountain like a streaking comet, you know you're traveling some. On the straightaways you go from 60 to 70 miles an hour when you are bobbing along at a breakneck clip.

I was the brakeman on the championship four-man bobsled team which won the Olympics for the United States last February. Billy Fiske, as I have already said, was the pilot. The other two members of the team were Eddie Eagan, former Rhodes scholar, 1924 Olympic boxing champion and prominent New York sportsman, and Clifford Gray, a well-known actor and song writer.

Speeding Up Sled While Moving

As the brakeman I acted in a role similar to that of a coxswain on a racing crew. My voice guided the men as if I was stroking a crew. I would call out, "One-two-bob!" in a steady rhythm.

The bobbing movement, which gives the sled increased momentum, consists of swaying backward and forward, with all bodies going in time. There is a suggestion of a forward jerk which tends to drive the sled into a higher speed. This is done on the straightaways.

The best time, of course, is made on these level lanes, unhampered by tricky bends. But seconds count very much in this sport. As a matter of fact, it was the difference of a few seconds which gave our team its victory and the Olympic championship.

The adept and fearless pilot saves seconds by cutting the turns at the sharpest angles and riding the most dangerous banks.

In a championship race the brakeman

A secret of increasing speed. Applying blowtorch to runners just before starting eliminates tendency to stick to snow.

rarely uses the sharp steel prongs which make up the brake. His eye is riveted on the course. He is constantly making an estimate of the speed and prodding the men along on their *"One-Two-Bob!"* litany. His hand is steadily on the brake as he is on the alert for a possible obstruction which might cause an accident.

In joy-riding the brake may be used sparingly and every little element of danger thereby eliminated. That was one of our chief accomplishments at Lake Placid. We demonstrated to the American public and the sporting world in particular that bobsledding is available to everybody and that its hazards are diminished by the lessons

Tractors Are Used in Hauling Sleds Up Mountainside to Top of Course

Bobsleds, weighing 485 lbs., are too heavy to be hauled uphill by hand, so the services of a tractor are employed. At left, members of the "Red Devils" team demonstrate their idea of what the well-dressed bobsledder will wear. Note the masks covering the entire face to protect against head injuries.

Here's what happens when a speeding bobsled jumps the track. Note how the sled was wrapped around tree, injuring all members of the speeding German four-man team.

we learned and which I am now relating to you.

Unfortunately, there were a number of mishaps at the Mount Van Hoevenberg bobrun during the Olympic season there. Paradoxically, it seemed strange that those who met with accidents were Old World sportsmen and that Americans, with whom the sport was comparatively new, escaped from any untoward event.

One day an Austrian boblet, which seats two men, catapulted up the right angle wall of the Shady Corner turn and upset, tossing the occupants to the bottom of the trough.

A second accident was miraculously averted the same day when a Swiss four-man sled, piloted by the 20-year-old Reto Capadrutt, made the mile and a half descent with a broken axle. The steel was unable to stand the strain in zero weather.

Two German bobsleigh teams crashed over the sides of turns with serious injuries resulting. Captain Werner Zahn's four-man sled climbed the icy bank of Zig-Zag and was precipitated 50 feet into space before it landed and came to a halt down the mountain side. They had been going more than a mile a minute.

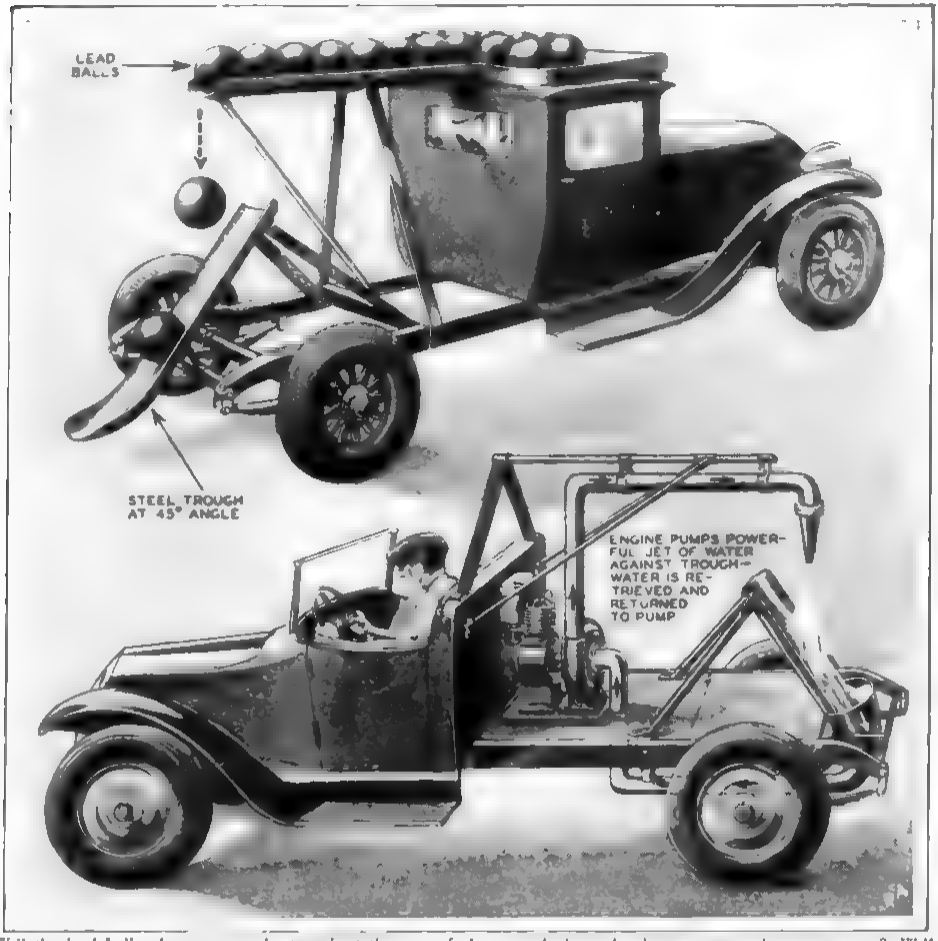
Runner Design Helped U. S. Team

One lesson we derived from these regrettable incidents is that the American sleds with flat runners are superior to the foreign ones with round plates. Ours have little trouble sticking to the course.

Our adversaries contended that the round runners met with less friction. That might have been true as applied on the straightaways, but the round ones were useless in the curves. A diagram accompanying this story shows just why we placed our faith in the flat-runnered sled.

One novel trick that was used during the bobsled events was that resorted to by Hubert Stevens who, with his brother, Curtis, set a world record mark on a two-man sled by doing the run in 1:57.68. Stevens used two acetylene blow torches to heat the runners of his sled in order to lessen their gripping effect on the snow.

$10 for the best Letter Answering the Question: *Will These Vehicles Run?*



Will the lead balls, dropping on the trough at the rear of the top vehicle in the drawing, cause the car to move? Will the water, pumped against the trough in the second vehicle, impart motion to the car? Ten dollars for the best letter.

HERE'S a real brain tickler for puzzle fans study the drawings above, figure out whether the lead balls and the water motor will move the vehicles or not (and why), send in your less than 300 word letter giving your reasons, and you may be rewarded with a check for $10.

Somebody's bound to win that $10 check; it might just as well be you. There are no hidden tricks in these drawings. All you need is an understanding of natural laws. In addition to the $10 award for the best letter, all other letters published will be paid for at regular space rates.

Keep your letter under 300 words, and be sure to mail it before May 15, 1932. Address letters to the Freak Vehicle Editor, Modern Mechanics and Inventions, 529 S. Seventh St., Minneapolis, Minn.

Don't fail to tell *why* the vehicles will or will not run. Here is the problem:

A vehicle carries a number of heavy lead balls, on its roof, which fall off the end of a trough and strike a second trough, mounted at a 45 degree angle at the rear of the car. Will the falling of the balls make the vehicle move?

The second vehicle is similar to the first, except that water is used instead of lead balls. The water is pumped against the trough by a motor, is retrieved in a funnel after it has passed down the trough, and is used over again. Will the water power move this vehicle?

Small Gasoline Motor for Weed Cutter Is Carried on Back

The gasoline motor harnessed on the back of the operator, as shown, furnishes power for the weed cutting machine.

A SMALL gasoline motor carried on the back of the operator furnishes power for a new weed-cutting machine recently introduced in Germany. The motor is light enough so that it can be supported in harness, eliminating fatigue.

The cutter is adjusted on a garden hand plow, power being delivered to it by means of a flexible shaft, as shown at the left. A lever on the plow handle controls the engine.

Initials Engraved on Fingernail

MONOGRAMED fingernails is the latest fashion in fingernail adornment. The initial is put on by an engraving stencil filled with warm wax. Different shades of wax are used to match the stone in the finger ring or the dress.

The Old English initial is the popular choice.

In new fad, initials are engraved on nails with stencil filled with warm, colored wax.

Brush Cleans With Rubber Ridges

SIX rows of hard rubber ridges are the "bristles" in a new clothes brush recently placed on the market. Solidly embedded in the wooden handle, these rubber ridges do an effective job of cleaning and brushing when rubbed over a fabric.

Hard rubber stripe of brush shown here do a good job of cleaning when rubbed on fabric.

The outstanding feature of the rubber brush is that hair and lint do not cling to it so that it is easy to keep clean.

Why Fat Women Are the Happiest

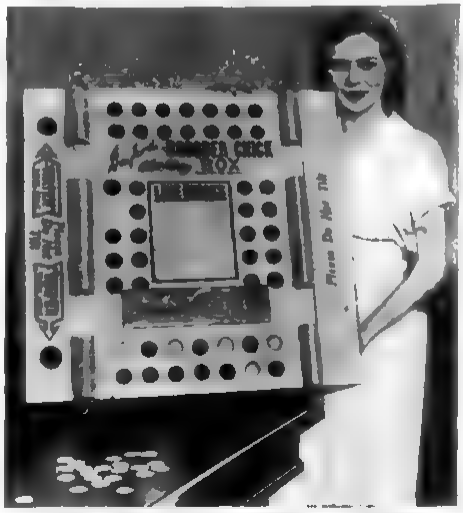
FAT women, especially those in middle age, are usually happier than thin women because they are better equipped to withstand the nervous strain brought on by the active pace now required of middle age women, according to Dr. McPhedran, of Toronto.

Women of 40 and 50 are expected to manage the household, take an active part in club and civic affairs, and still be fresh for parties in the evening.

All this is contrary to nature, and a reasonable degree of plumpness cushions the body against physical shocks and strain.

Safe Coop for Shipping Chicks

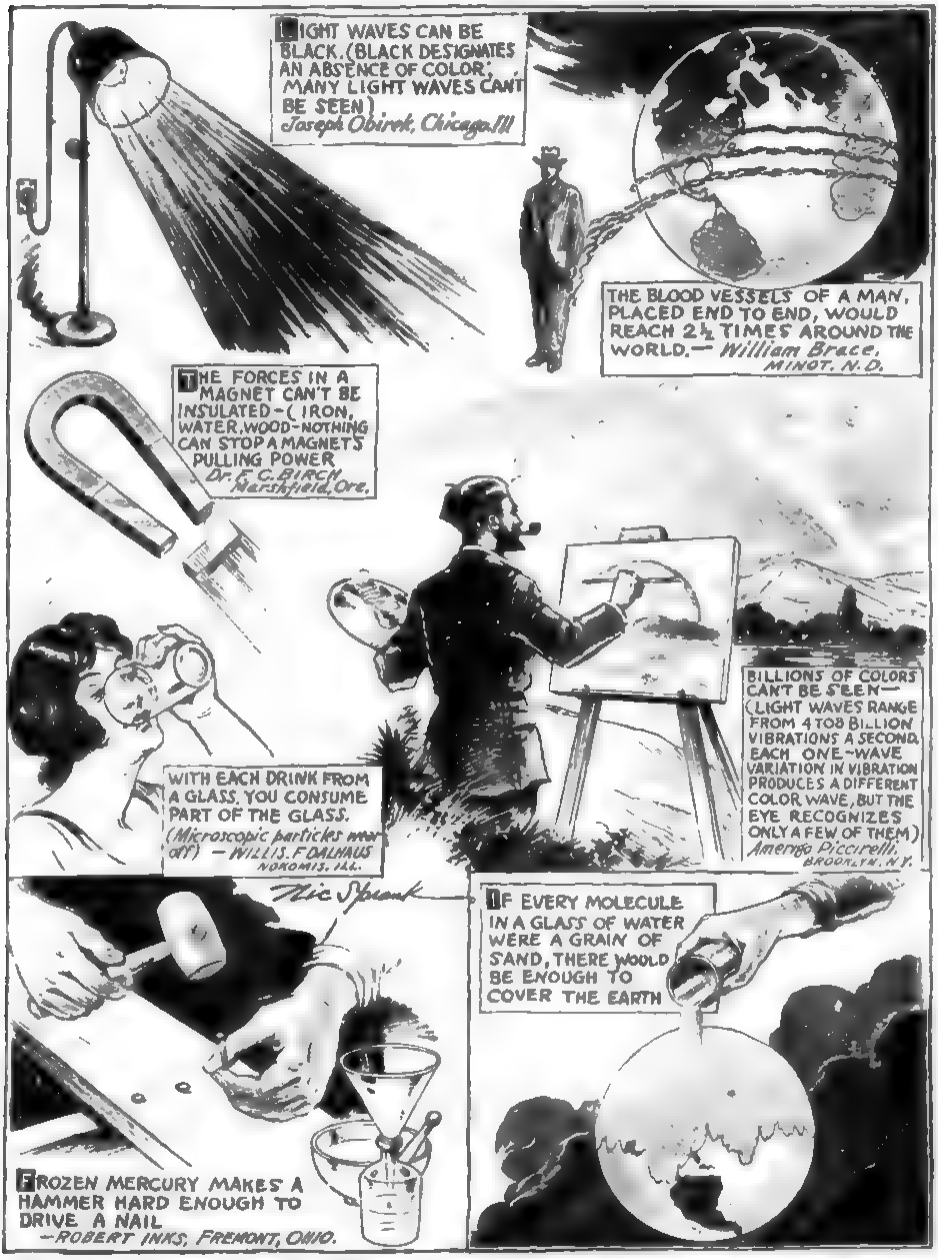
FORTY-EIGHT brooder chicks up to four weeks old can be shipped 1500 miles with ample food and water provisions in the new inexpensive portable coop shown below. Ridges on the top and sides prevent baggage men from shutting off ventilation when piling the coops.



The ridges on the coop withstand 450 pound pressure, prevent ventilation holes from being covered up in shipment.

Oddities of SCIENCE

by NIC SPRANK



ONE DOLLAR will be paid by Nic Sprank for oddities of science used on this page. Send in your ideas—no limit to the number of suggestions you may make, but be sure to enclose proof of your statements. Maybe your ideas will be better than those shown on this page—if they are, Nic Sprank wants them and will be glad to send you a check, as well as credit you with authorship in the drawing. Address suggestions to Nic Sprank, care of Modern Mechanics and Inventions.

Rubber from the SUN

Amazing experiments conducted on the American desert point the way toward the day when the sun will be the universal source of power for industry—and also the manufacturing source of rubber, nitrates, and other organic compounds. This authentic article explains how such results were achieved, and describes probable future developments.

SOME day your automobile may run on rubber tires manufactured from sunlight. And some day, too, that same automobile may be driven by a solar motor, deriving its power from the energy stored up in the sun's heat rays.

Astonishing as these statements may seem, they follow very naturally out of a series of amazing experiments conducted last summer by Dr. J. W. D. Chesney of Maywood, Illinois. Dr. Chesney is a recognized leader in this fascinating branch of science, having worked with sunlight for many years, developing a number of processes on which he holds basic patents.

How can rubber be produced from the sun? The method is explained later on in this article; the diagram on page 63 illustrates the principle. Rubber is only one of the items which Dr. Chesney proved can be manufactured with the aid of sunlight. On a laboratory scale he succeeded in making chloroform, carbon tetrachloride, and other substances through the action of sunlight on natural gas.

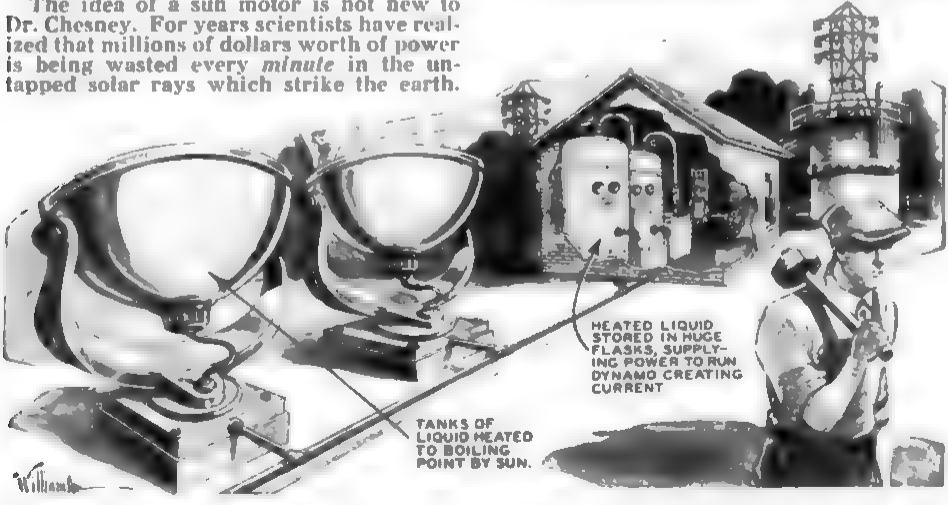
The idea of a sun motor is not new to Dr. Chesney. For years scientists have realized that millions of dollars worth of power is being wasted every *minute* in the untapped solar rays which strike the earth. Using a sun motor only 10% efficient, the state of Arizona could furnish twice the amount of power obtained in the United States from coal, oil, and water.

If this seems an exaggeration, look at the photograph on the opposite page, which shows Dr. Chesney's four-foot sun mirror, reproduced on this month's cover, in action. The sun's rays, concentrated by the mirror into a three-inch disk, burned through a piece of sheet metal in a few seconds.

Storage Method Is Problem

The greatest difficulty in the utilization of solar energy for power lies in the lack of suitable storage methods, so that energy can be piled up for use on rainy days and at night. This is by no means an insurmountable difficulty. Dr. Chesney proposes a system in which certain liquids of high boiling point are heated by the sun and the heated liquid stored in modified Dewar flasks, to be called on as needed.

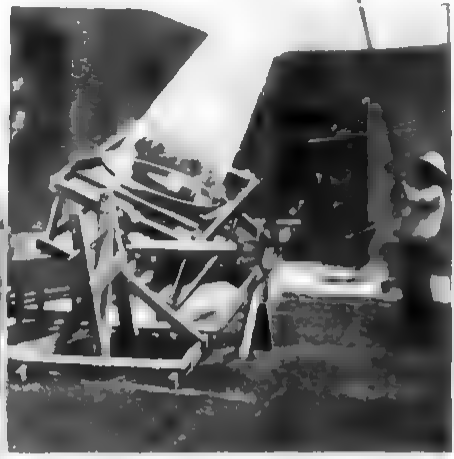
There is nothing fantastic in this idea. In an experimental plant which was con-



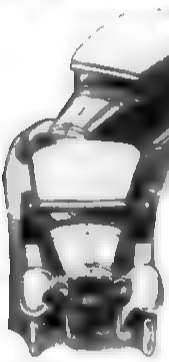
One method of storing solar energy, which has proved successful in tests, is suggested by Dr. Chesney. Tanks of liquid of high boiling point are heated by the sun and the hot liquid stored in insulated flasks, from which it can be withdrawn as needed to convert water into steam to drive electric dynamos. Mirrors concentrate sun on liquid.

—and POWER Too!

220 horsepower, equivalent to that of four motor cars, is the average amount of solar energy radiated to the roof of a bungalow.



Dr. Chesney's sun mirror burned a hole through sheet metal in a few seconds, demonstrating power of rays.



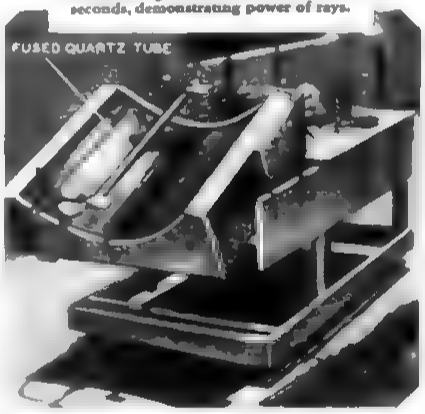
structed, thin metal tubes were passed through the hot liquid. When water was poured through the tubes, heated by the liquid, it was transformed into steam.

Still another storage method would be to convert solar radiation into thermo-electricity by concentrating sunshine on hot junctions and charging storage batteries. This stunt has actually been done in Chicago. Sunlight concentrated on hot junctions, 100 pairs, produced enough electric current to charge a 6-volt storage battery or to run an electric motor which operated small toys.

Sun Generator Will Come

The world awaits a thermo-electric generator; some day it's bound to come, for present sources of power—coal and oil—are definitely limited. Within a comparatively few years they will be entirely exhausted. Considering these facts, it is amazing how scientific research has lagged behind in this field. Dr. Chesney is convinced that if a small fraction of the money now used in attempts to smash the atom were expended on sun power development, the power question would be forever solved.

Suppose, for instance, that you could harness and store the sunshine that falls on the roof of your home. Assuming that you have an average bungalow, 30x40 feet, the amount of sunlight that falls on the 133 yards thus represented equals 220 horsepower—roughly equivalent to the power of four average motor cars, as illustrated in the accompanying drawing. Why, then, are you buying coal, gas, and electricity?



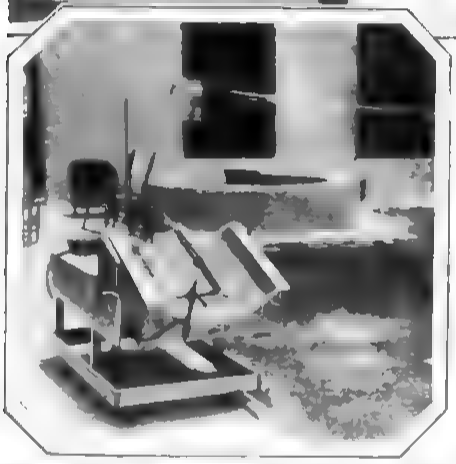
Apparatus used in manufacturing rubber and other compounds. Quartz tube is used because it permits ultra-violet rays of sun to pass through it, acting on the chemicals inside.

No less interesting than the power possibilities of the sun are its photosynthetic abilities (meaning the capacity of building up compounds with light).

We have already mentioned rubber as being manufactured in this way. Let's see how Dr. Chesney did it. First he constructed a chromium-plated cylindrical reflector, illustrated herewith, which concentrated the sun's rays on a fused quartz tube. Quartz

Chromium-Plated Reflectors Concentrate Sun to 3000° Temperatures

Using this apparatus, natural gas was transformed into carbon tetrachloride, chloroform, etc., through action of sun's rays concentrated on gases carried through fused quartz tubes. Quartz had to be used because the tremendous temperatures developed by apparatus would have melted glass.



This type of reflector was used in manufacturing compounds by sun chemistry. The reflector concentrates sun's rays on quartz tube containing various gases to be acted upon.

was used because it transmits the sun's ultra-violet rays.

Then he passed a mixture of acetylene and hydrochloric acid gas through mercuric chloride (a catalyst) and vinyl chlorid was formed. Vinyl chlorid, when exposed to the shorter rays of sunlight in the presence of certain uranium salts, is converted into caoutchouc chloride. Caoutchouc is raw rubber, which remains after the chlorine radical is removed from the compound.

Dr. Chesney reports the process of manufacture as very simple, but, because of price, not commercially feasible at present.

Sun chemistry is not a mysterious science. You yourself, if you have ever taken a snapshot with a camera, have performed a successful experiment in sun chemistry, in which refracted sunlight, acting on the sensitive emulsion of plate or film, changed one silver salt into another and thus produced a photographic negative.

Design of Solar Reflector

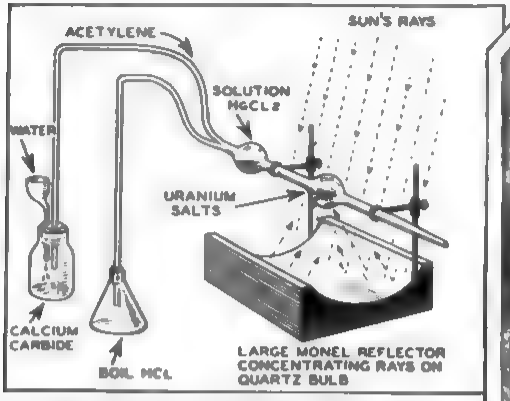
There was nothing in the least complicated about Dr. Chesney's apparatus. The reflectors used in his sun chemistry experiments can easily be built by almost anyone. Sheets of chromium-plated copper were fastened to a wooden base, as shown in the photographs on this page, producing such a high concentration of solar energy at the focus that it was necessary at times to use water-cooled cells to avoid burning up the end products of the experiments. Temperatures of 2000 to 3000 degrees centigrade were easily obtained by concentrating sunlight.

At this temperature it is possible to make nitrates from the atmosphere. Oxygen and nitrogen from the air is caused to unite at this heat, and if cooled very quickly will dissolve in water as nitric acid. It is difficult to over-estimate the importance of this particular process when one remembers that nitrate fertilizer is the only means of restoring the productiveness of farm land exhausted of its mineral riches through constant use.

Making Chloroform From Natural Gas

With this same type of apparatus natural gas was caused to combine with chlorine under action of solar radiation, producing chloroform and many other compounds. Thus far the process has only been conducted on a laboratory scale, but all great chemical discoveries start in the laboratory

Diagram Explains How Rubber Is Manufactured by Use of Sunlight



Here's the principle of manufacturing rubber from sunlight. Acetylene and hydrochloric acid gas is passed through mercuric chloride ($HgCl_2$, a catalyst) forming vinyl chlorid, which when exposed to concentrated rays of sunlight in presence of certain uranium salts is converted into caoutchouc chloride. Removal of chloride radical leaves pure caoutchouc, or raw rubber.

and are later expanded to commercial proportions. The great American southwest, with its perpetual sunshine and burning deserts, may some day be dotted with hundreds of factories using the sun not only as a source of power for moving their wheels, but also as the prime mover in the process of manufacture.

Sun Baths Taken Internally

Sun baths have in recent years become a popular health fad. The ultra-violet rays of the sun convert the ergosterol of the skin into vitamin D, which passes into the circulation and brings about the utilization of certain minerals. Knowing this to be true, Dr. Chesney's staff attempted to convert ergosterol into vitamin D with natural unconcentrated sunlight. Ergosterol was dissolved in various solvents and exposed to the sun.

In every case success was attained in getting activation in some slight degree, but not in sufficient concentration to make it a commercial feasibility. Refinements now being conducted indicate that the day may come when, instead of exposing our bodies to the sun, we may achieve the same health results by adding a concentrated vitamin source to the diet.

To return to the power possibilities of the sun, one of the photographs on this page shows an experiment which you can easily duplicate if you are skeptical. The direct rays of the sun, streaming through a basement window, struck a reflector and were focused on the hot junction of a Cenco thermo-electric magnet. In a few minutes sufficient electricity was generated to hold up a bucket containing 100 pounds of pig lead.

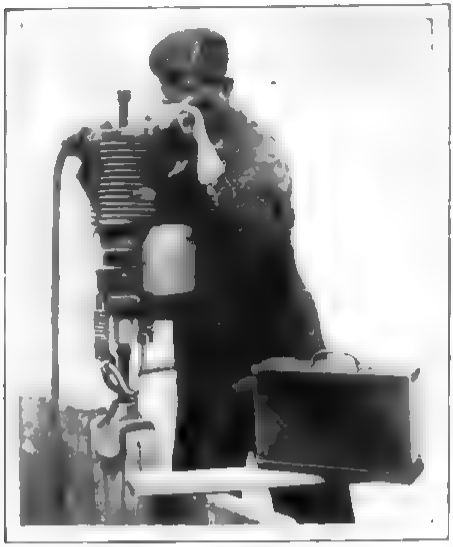
In a variation of the experiment, under the same condition, sun coming through the window was concentrated on the slit of a thermocouple, and the current produced

These experiments were conducted in a basement, using sun streaming through a window. Here we have sunlight concentrated on a thermocouple, creating a current detected on a galvanometer.

detected on a galvanometer. With 25 couples a small electric motor was caused to run. Any experimenter can perform part of this feat if he has a delicate galvanometer, a parabolic mirror, and a small amount of copper and wire for thermocouples.

Checking the accepted figures which give the solar constant as 1.7 horsepower per square yard, Dr. Chesney found the total to average slightly higher than this. Reduced into terms of dollars and cents, this means that *every second* $478,000,000 worth of solar radiation is wasted.

88-Pound Power Hammer Operated by Built-in Gas Motor



A one-cylinder gasoline motor is built right in this power hammer. Total weight of machine is only 88 pounds.

BREAKING up concrete, driving sheeting and digging into frozen ground are just a few of the jobs made easier by the motor-driven power hammer shown at the left. Its small size and light weight make it especially effective in places inaccessible by the heavier, more complicated types of machines now in use.

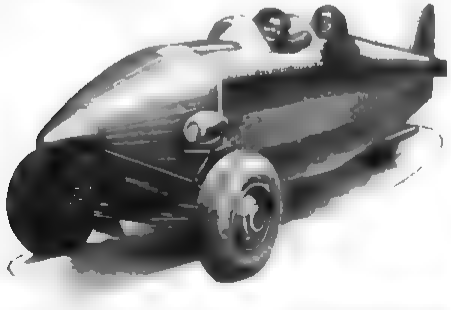
The hammer has a one-cylinder, gasoline motor attached and weighs only 88 pounds complete. The two-gallon tank holds enough fuel to run the machine for two hours. As the photo shows, one man can handle the entire equipment easily.

Gasoline Brightens Car Carpets

AFTER removing the dust from the floor carpets of your car by beating or by use of the vacuum cleaner, you can brighten them up by rubbing their surface with a sponge that has been dampened with gasoline. Best results are obtained by not having the sponge too wet.

Car Body From Airplane Fuselage

AN AIRPLANE fuselage constitutes the body of the completely streamlined car shown below. The power plant and rear wheel of a motorcycle, a Ford front axle assembly, and three "doughnut" tires complete the make-up of the cigar-shaped car. It has a 130-inch wheelbase, will go 50 miles an hour, and goes from 45 to 50 miles on a gallon of gasoline. Efficient streamlining of this car reduces wind resistance to a minimum.



Built from an airplane fuselage and a motorcycle engine, this three-wheeled car will hit off 50 miles per hour clip.

Four Rotating Magnets Run Clock

NO MATTER how closely you listen, you can't hear this clock tick because four rotating magnets have replaced the old gears, making the clock "tickless." The mechanism of this new timepiece, shown below, is made up of four magnetic fields. One rotates every second; one each minute; the third each hour; and the fourth operates the hour hand at the rate of one revolution every twelve hours.

The new clock must be set face up on a table or support because the mechanism doesn't function properly when hung on a wall or placed on the mantel.

Gearless clock shown above requires no winding and keeps perfect time by means of four rotating magnetic fields.

Crystal Honey Made in a Hurry

SCIENTISTS at Cornell University improved on Nature's process of crystallizing honey and have produced a substance that looks like opaque, gray-white butter, but really is honey.

The new product is called "crystal honey." It has a slightly different flavor than the natural honey, does not drip or spread in sticky smears, and, if canned or placed in a glass, can be kept indefinitely. Nature requires months and sometimes years to crystallize honey. The scientists found that by giving a small dose of these crystals to the natural honey at the right temperature, crystallization was effected with firecracker-like quickness.

3-Wheeled "Sailcycle" Hits Off a 40-Mile Clip in Breeze

FORTY miles an hour in a normal wind and sixty in a gale is the speed claimed by Wolfgang Van Bolton, young German inventor, for his three-wheeled sailcycle shown in the accompanying photo.

The sail is fastened into a triangular-shaped frame on the front axle and can easily be swung to catch the wind by the skipper. Three ordinary bicycle wheels are used on this "sailcycle," which is steered by a lever on the rear wheel. The speed of the cycle can be altered by manipulating the sail in and out of the wind.

This three-wheeled "sailcycle" will do 40 miles an hour.

Radio Speaker Like Chandelier

Loud speaker hangs from ceiling like ornamental chandelier.

LOUD speakers which are placed in or on top of your receiving set cabinet are now being supplanted by a new amplifier that hangs from the ceiling like a beautiful metal chandelier.

The new amplifier is made up of a number of tone tubes which not only amplify the sounds but also give musical notes a rich tone. Each tube tones one note. Any electrical connection may be used between receiving set and chandelier.

How to Avoid Colds After Chill

TO PREVENT a cold following a chill, first warm the body quickly by external heat—such as from a fire or from hot drinks. Then increase the heat inside the body by exercise or by foods such as hot soup or sugar which are assimilated quickly.

Racing Canoes With Large Umbrella for Sails Is Popular Water Sport

RACING canoes with umbrellas for sails has become a popular water sport at the southern resorts and will undoubtedly be taken up seriously everywhere this summer.

The canoes are jockeyed into place along the starting line by paddling, and the overgrown umbrellas are then opened for action. At the starting signal, paddles are taken from the water and the canoes start off under full sail. In some races the "skipper" is allowed to use the paddle to keep the canoe in its course and prevent collisions.

The racers shown above are waiting for the starter's signal to pull in their paddles and start off under a full sail.

Spiral Muffler Now Eliminates Airplane Exhaust Roar

Practically all the roar of the exhaust is eliminated by this five-foot muffler, which is so designed that exhaust gases travel in a 45-foot spiral before being released into the open air. The cooling area is also increased approximately 2½ times.

Device Shows Speed at Auto Crash

A NEW device called "Strikometer," which is easily built into a speedometer, automatically locks the speed indicator upon a lateral impact. This shows the speed of the car when struck and is an irrefutable witness in an accident.

When car is struck from side, indicator locks on car speed.

The locking device consists of a pendulous weight in a spring socket. When the weight is displaced by impact of a crash, the socket rises under the spring pressure and engages the needle, so that it cannot be forced back into place. The instrument does not react to horizontal jolting.

Tests Quality of Canned Goods

CHEMISTS of the food control laboratory, Washington, have developed a machine which measures the quality of canned peas, peaches, pears and such foods by the amount of mercury necessary to crush the test piece.

The piece to be tested is placed under a metal disk attached to a plunger, which registers the weight of the fluid. In the case of fruits, tenderness is determined by the pressure necessary for a cylindrical rod to penetrate.

Repeated tests have proven that the machine reflects the consensus of expert graders as to what constitutes a standard and a sub-standard product.

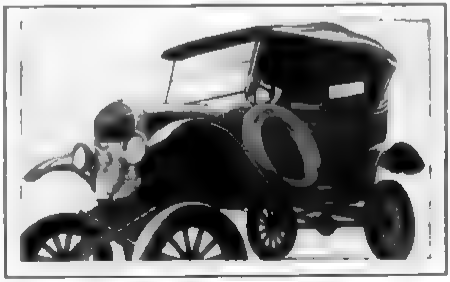
REALIZING that the trend in air transportation is towards night travel, aircraft manufacturers have developed a new muffler which practically eliminates motor roar so that passengers can sleep undisturbed in "flying pullmans."

The new muffler literally wears out exhaust noises by causing them to run around in circles. Although the external length of the muffler is only five feet, the interior is designed in the form of a stationary screw which spins the gases, causing them to travel an additional 48 feet before being released into the open air.

The result is a 75 per cent decrease in noise volume and at the same time a [illegible] reduction in back pressure.

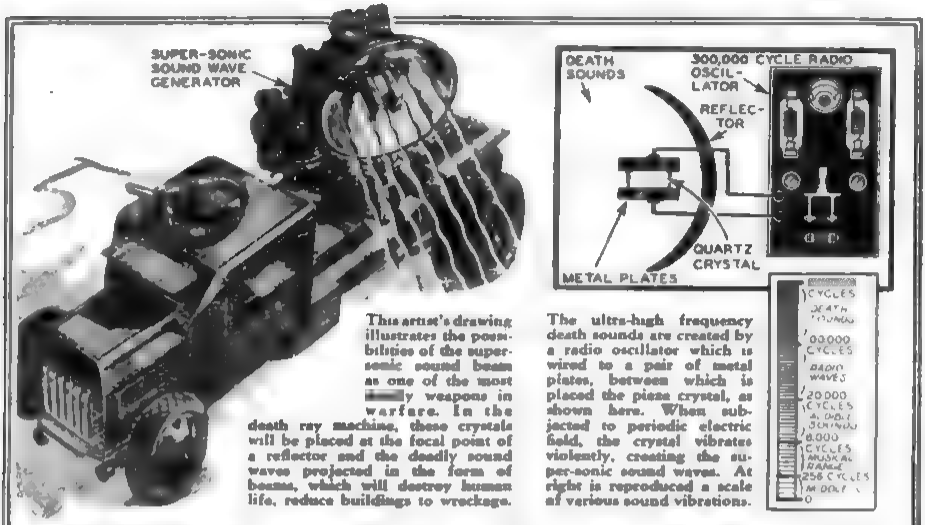
Ford Navigates in Flood Areas

"SERVICE regardless of flood water" is the motto of a Mississippi taxi driver who "raised" his Ford to meet the occasion. The body is elevated from the axles by using simple metal cross-frames. An elongated drive shaft and steering apparatus complete the job.



Elevated above the axles by means of metal cross-frames, this Ford will navigate in waters up to four feet deep.

Death Rays from Silent Sounds



This artist's drawing illustrates the possibilities of the super-sonic sound beam as one of the most [illegible]y weapons in warfare. In the death ray machine, these crystals will be placed at the focal point of a reflector and the deadly sound waves projected in the form of beams, which will destroy human life, reduce buildings to wreckage.

The ultra-high frequency death sounds are created by a radio oscillator which is wired to a pair of metal plates, between which is placed the piezo crystal, as shown here. When subjected to periodic electric field, the crystal vibrates violently, creating the super-sonic sound waves. At right is reproduced a scale of various sound vibrations.

THE day of death rays in warfare was foreshadowed in an experiment conducted recently at Johns Hopkins University in which a beam of ultra-frequency sound waves instantly converted glass into a thin white powder, oil into thin vapor, and wood into a burst of flame.

These amazing new sounds, with frequencies as high as 300,000 vibrations per second, inaudible to the human ear, were created with a standard radio oscillator of the vacuum tube type, as illustrated in an accompanying drawing. In converting this wild but powerful current into sounds, scientists make use of what is known as piezo crystal which contracts and expands violently when subjected to a periodic electric field set up between two metal plates connected to the radio oscillator.

In demonstrating the death-dealing effect of the "silent sounds," a frog was placed in a beaker, which rested on the quartz crystal. The frog died almost instantly, due to the coagulation of red corpuscles in the body. In another experiment glass exposed to the waves was shattered to a fine white powder.

To date no attempt has been made to extend the terrible killing power of these sound waves beyond the laboratory bench, but army experts who have witnessed the experiments believe that here, for the first time, they have discovered the real "death ray." In this discovery, warring forces would have a weapon that would not only annihilate armies, but would also bring airships and planes spinning to earth in a mass of flames.

Perfect $7500 Race Car Model Made of Gold and Silver

Perfect eighth-scale reproduction of every working part of a race car is achieved in this $7500 gold and silver model.

PRONOUNCED by Harry A. Miller, world-renowned designer of racing automobiles, as the most perfect model in the world, the eighth-scale reproduction of the newest type racing car, shown in the photo at the left, has every working part of a full-size automobile duplicated in miniature.

Pistons slide in tiny cylinders, steering gear operates in regulation fashion—even speedometer and oil gauges, hardly larger than the head of a match, function perfectly. The model is the creation of L. F. Angevine, of Southgate, Cal., who calls it "the only $7,500 automobile that won't run." This is due to impossibility of carburetion.

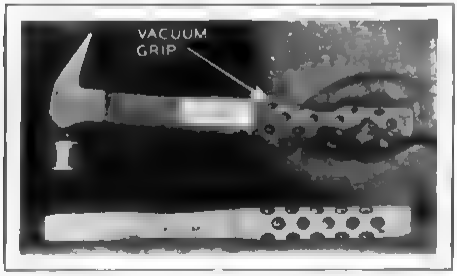
Each of the 1157 individual parts, which make up the model is built in exact scale.

Tall Children Smarter?

TALL children are more intelligent than short ones, at least among a group of more than a thousand boys and girls in Glasgow, Scotland, tests on whom are reported by Dr. Shepherd Dawson and Mr. J. C. M. Conn in a recent report by the Medical Research Council of Great Britain. All of the thousand children were sick, being patients in the Royal Hospital for Sick Children, but the intelligence ratings of these thousand patients were compared with other Glasgow children in good health to make sure the average ratings of the two groups were approximately the same. This comparison between sick children and well ones constituted, indeed, the chief reason for the investigation and resulted in the conclusion that the average sick child is neither less intelligent nor more so than the average healthy one.

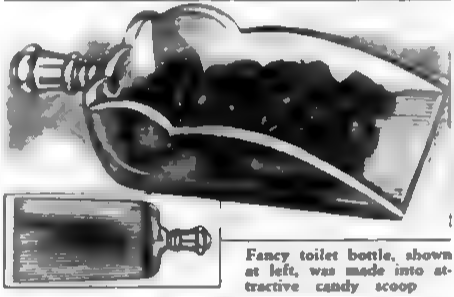
No Callouses From These Tools

TOOL handles with cup-like depressions in the sides are now available to workmen. It is claimed that the depressions form a vacuum when the hand presses against them, helping to maintain a firm grip on the tool without grasping the handle so firmly as to cause callouses.



Depressions in hammer handle create vacuum when hand presses against them, removing need for gripping tightly.

Bottles Make Fancy Scoops

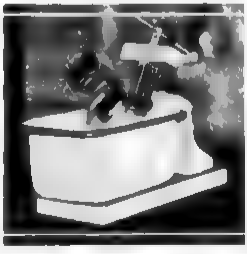


Fancy toilet bottle, shown at left, was made into attractive candy scoop

THERE'S no trick to converting a fancy toilet bottle into an attractive candy scoop like that shown above. Here's how: Glue the glass cork into the bottle; this will be the handle. Outline your design in chalk, then go over the chalk marks with a glass cutter several times to cut deeply. Saturate a piece of cotton with kerosene and rub over the grooves, then hold over a gas plate for a moment. Immediately after drop the bottle in cold water, and it will break along the grooves. Use a fine nail file to round off sharp edges.

Films Developed in Daylight

A FILM envelope, porous to liquids but opaque to light, in which X-ray films can be placed at the factory so that the whole envelope can be dropped into chemicals and developed in daylight, has been invented by Dr. S. T. Jonas, a Chicago dentist.



X-ray films, contained inside black envelopes porous to liquids, developed in daylight.

Bridge Games Shown from Life on Screen

Projector of the new bridgeoscope can be seen directly above the man's hands, with microphone beneath it. The principle of its operation is explained by the diagram.

FOLKS who enjoy playing the game of bridge will soon be able to step into their favorite movie theaters and watch an actual bridge game being played on the movie screen. It will be a picture from life, not a mere movie—the players will be located in the basement of the theater, and the scene shown will be an actual reproduction of their plays, flashed upon the screen by an ingenious arrangement of lights and mirrors. The bids and card table small-talk of the players will be broadcast to the audience through the theater sound system.

Credit for the invention and patenting of the device which makes this possible goes to Louis St. Pierre, manager of the Coronado theater of Rockford, Illinois.

The principles of the "bridgeoscope" are simple. Players are seated around a card table covered with black velvet, against which the white cards stand out distinctly in the glare of ten 1000-watt lamps focused on the set. Directly above the card table is a combination camera-projector equipped with four special lenses.

Above this projector is placed a mirror which reflects the concentrated light-rays from the projector upon a second mirror, set at such an angle that the reflection is thrown upon the front of the movie screen. The bridgeoscope is mounted in an especially sound-proofed room in the orchestra pit, below the stage and in front of it.

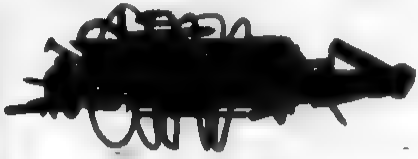
Natural Colors Shown

Cards are reproduced in natural colors, many times magnified. As the audience watches the bridge game progress, an expert explains the play. The audience at all times sees the cards held by each player, so that devotees of the game will have a chance to figure out how they would play the cards.

The bridgeoscope has numerous other uses. For instance, a girl can demonstrate hair-dressing and make-up secrets; a billiard game can be shown; a cartoonist can draw pictures; the theater manager can advertise forthcoming attractions by writing and talking directly to the audience—and there are dozens of similar applications.

LATEST MIRACLES

Hospitals are now utilizing this new shock-proof X-ray machine in diagnosing ailments of patients accurately.



X-ray examination of a package sent to a public official disclosed this powerful bomb, which would have meant death had the bundle been opened.

Performing such a wide variety of tasks as testing structural metals, detecting fake paintings and forged checks, curing cancer and giving medical men an intimate view of body organs — the X-ray is now playing a leading part in our everyday lives. In this article Mr. Lincoln explains the latest miracles accomplished by X-rays.

Customs inspectors are now employing X-rays to facilitate examination of effects of incoming passengers. Above is shown customs men inspecting suitcase with fluoroscope to detect contraband material. Opening of bags is thus avoided.

SCIENCE has finally brought the X-ray close to home. Two years ago the average man thought of the X-ray machine as an apparatus used by doctors to trace foreign particles in the body or for discovering bone fractures. It was regarded as something preternatural, miraculous and utterly beyond the realm of human comprehension.

But today the X-ray and its closely affiliated relatives, the cosmic, gamma and ultraviolet rays, figure vitally in our every day existence. The mechanical uses of the X-ray have become manifold. They are making use of the rays extensively in certain industries where two years ago their absence caused engineers to quake with horror at the thought of catastrophes they confronted.

Professor Wilhelm Konrad Rontgen, a wizened though mentally alacritous German physicist, discovered the X-rays in his musty laboratory 37 years ago. It was a purely accidental event. His shrewd, quick-perceiving eyes sparkled as they beheld a strange luminescence when a radiation penetrated barium salts.

Rontgen Discoverer of X-rays

He knew of no category into which to place these mysterious emanations. He was defeated in his attempts to analyze them. He did ascertain one point definitely, however, and that was that the electric particles which produced these rays were of a different substance.

Since matter can neither be created nor destroyed, the German professor found himself handicapped when he tried to pry deeper into the origin of the ray he discovered and produced.

Rontgen never knew much more about

of the X-RAY

by BENNETT LINCOLN

the ray which he designated as the X-ray because of its enigmatical character. He did know, as scientists hold today, that the X-ray belongs to the family of light rays. He also knew that his X-ray was of a much shorter wavelength and that it obeyed the laws of electromagnetic radiation.

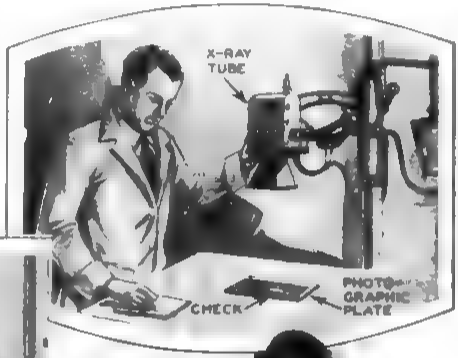
The new wonders of the X-ray have come about through the ceaseless efforts and experiments of scientists to reduce the mystery to a low common denominator. So that today the average man is becoming more and more conscious of the rays in his daily manner of living.

How X-ray Detected Forged Check

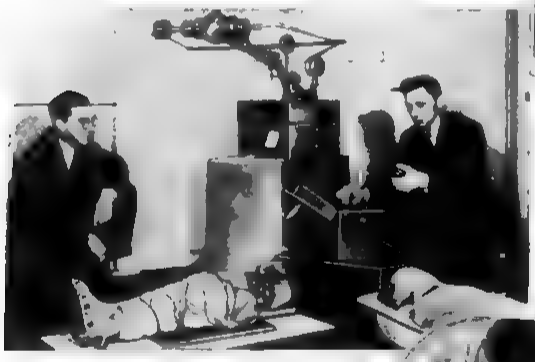
For instance, Rontgen would have done a back-flip in his grave could he have known on last January 12 that his discovery was being applied in the course of a criminal trial in the New York Court of General Sessions. A hushed, crowded courtroom beheld spellbound the spectacle of an X-ray machine on the counsel table before the judges.

Nathan (Nigger Nate) Raymond, a Broadway gambler who flourished during the Reign of Rothstein, having been later questioned about the murder of his illustrious crony, was on trial for forgery.

Albert S. Osborn, a writing expert, applied this particular X-ray to the purpose of detecting a forgery for the first time in the history of criminal trials in this country. Osborn testified, after making a study of the exhibits in the case, that the signature of a brokerage house had been erased from certain stock certificates by means of chemicals, and that thereafter the gambler



In recent court case X-ray was brought into service and [illegible] a forged sig- [illegible]



Above scientists are shown making X-ray of mummy to determine authenticity before purchase by a museum. Other relics of antiquity are similarly inspected.

A German shoe dealer has introduced the novel X-ray device shown at the right to give his customers greater satisfaction and proof that the shoes fit before they leave the shop. At left is shown shadowgraph of the foot which purchaser sees.

Here is how plumber employs X-ray machine to locate pipe in wall of house, saving considerable labor.

When examining wall with X-ray, here is the shadowgraph which the plumber sees. Broken electric wires can also be located in the same manner to save tearing out entire wall.

The X-ray proves extremely useful in aiding botanists in the study of plants to improve yield and hardihood. Above is shown photograph made of plant to study its structure in utmost detail.

In the world of art, X-ray plays a significant role. The drawing above illustrates how photograph disclosed infant in arms of madonna which had been painted out to make fake picture. Metropolitan Museum in New York now maintains a special X-ray department for this purpose.

indited his own name. He was found guilty and sent to Sing Sing prison.

Just two days previously engineers of the General Electric Company put the kibosh on that old saying about looking for a needle in a haystack. They placed a needle in a bale of excelsior, since hay is not to be had around Schnectady way in January, and they installed their bundle in the X-ray laboratory.

After a five-minute exposure, the bale revealed each foreign particle within it, including the needle that used to be so elusive. That particular experiment may not have any material value presently, but abundant notes were taken of the observations and a practical application may be devised for this in the future.

Coolidge Tube Operates on 900,000 Volts

Dr. William D. Coolidge, associate director of the General Electric Laboratories, is one of the pioneering scientific geniuses who has contributed to the modern store of X-ray marvels. He has just completed the Coolidge 900,000-volt X-ray tube. Before that the X-ray tubes of this nature ranged from 200,000 to 300,000 volts.

His apparatus consists of a double tube 12 feet 3 inches long and 20 inches in diameter. The source of its high voltage is an induction coil stepped up from an alternating current circuit of 1,100 volts in two stages of 450,000 volts each, as illustrated in an accompanying drawing.

Here is how the X-rays are produced in this tube: The high voltage wire is taken to a spherical electrode of brass, inside of which is placed a 12-volt storage battery of four amperes for supplying the current to the filament or cathode, that liberates the electrons.

In the next process the electrons are sent through a hole in a doughnut-shaped metal

shield. This first bends them into a concentrated beam, which becomes more divergent after shooting through the field.

Then we reach what is called the first-stage anode, which is an elongated, hollow copper tube. It is through this heavy tube that the electrons fly after being given a high velocity of 450,000 volts.

X-ray Penetrates 4 Inches of Iron

As the electrons emerge from this tube they reach within the influence of the second 450,000 volts, which steps them up, as they say, to the velocity of 99 per cent of that of light, the latter being the greatest speed attainable in nature, at which point mass is theoretically reduced to infinity. The product of this series of reactions is the X-ray.

"The X-rays produced," declared Dr. Coolidge, "represent only two-tenths of one per cent of the energy flowing between the cathode and the target. The remaining 99 8/10ths per cent is lost in the form of heat.

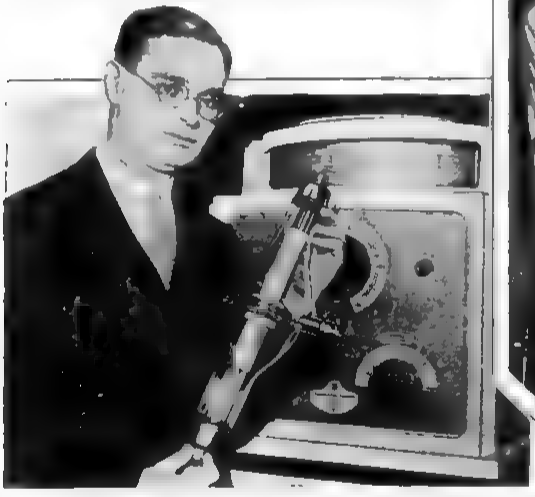
"Still the X-ray produced goes through a protective layer of copper 3 millimeters thick, then through 4 inches of iron, and retains sufficient power to take an X-ray picture."

This Coolidge tube is now used by the Memorial Hospital in New York City for the treatment of cancer. It has been found that the flying electrons which are released at a speed of 184,000 miles per second are equivalent to enormous amounts of radium.

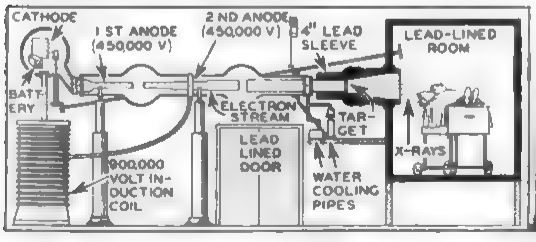
It has been calculated that at 700,000 volts and 5 milliamperes, the radiation emission from the Coolidge tube, is equivalent to that of 450 grams of radium, an amount which would cost $22,000,000 at current market prices.

Two Million-Volt X-ray Tube Developed

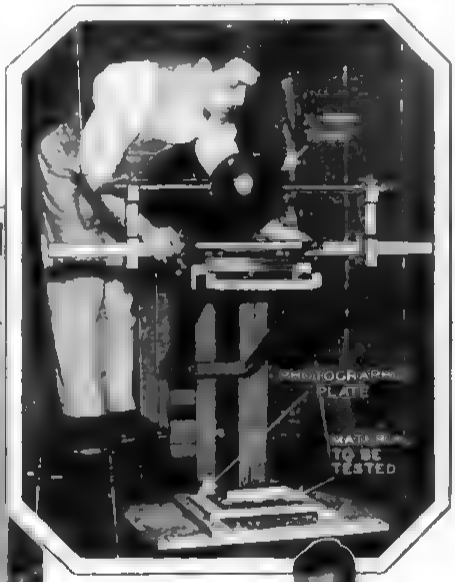
Three physicists of the Carnegie Institution's department of terrestial magnetism have developed a 2,000,000-volt X-ray tube. They are Drs. M. A. Tuve, L. R. Hafsted, and



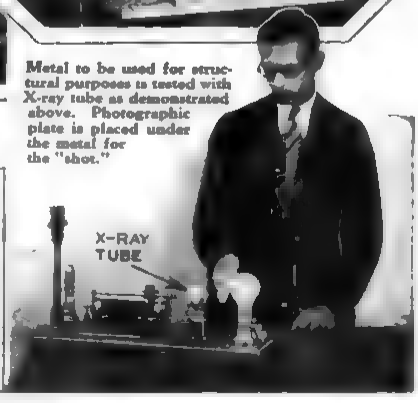
Here is an X-ray tube that works fast. It is capable of photographing inside of the human body at a speed of one-thousandth of a second, far faster than any taken before.



Drawing above shows the construction of the powerful 900,000-volt X-ray tube at Memorial Hospital, New York. Patient to be treated for cancer rests in lead-lined room at the right.



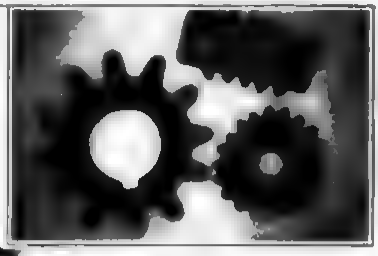
Metal to be used for structural purposes is tested with X-ray tube as demonstrated above. Photographic plate is placed under the metal for the "shot."



Small but powerful, this portable X-ray machine is especially suitable for inspecting thin metals or members of the body. Hand is being X-rayed in the photo.

900,000-Volt X-Ray Tube Photographs Gears With 30-Second Exposure

In preparation for making a photograph with the new 900,000-volt X-ray tube built at General Electric laboratories, scientist is shown here setting in place the casette, or film holder, in front of which are three gears to be X-rayed.



X-ray photograph of gears, from 30-second exposure, using 850,000 volts.

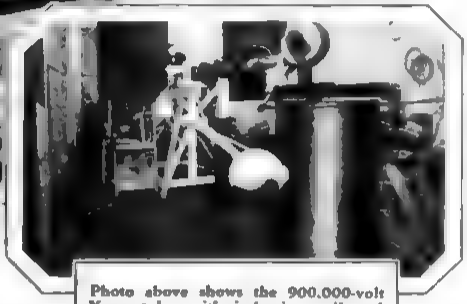
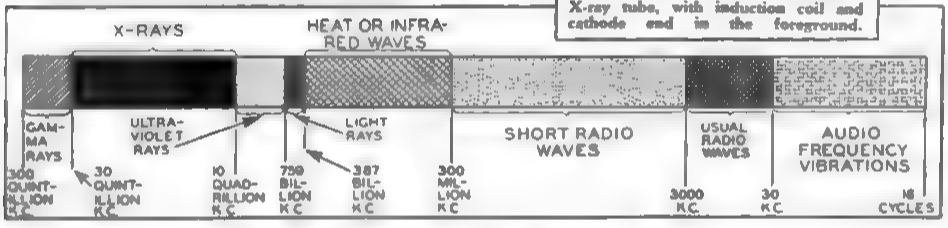


Photo above shows the 900,000-volt X-ray tube, with induction coil and cathode end in the foreground.



Note position of X-ray waves on scale above, which shows range from gamma rays of radium to audio frequency vibrations.

O. Dahl. Dr. Gregory Breit, now at New York University, worked with them at one stage. They spent several years perfecting the tube. The ray-force this tube develops is equivalent to $182,000,000 worth of radium for the treatment of cancer.

X-rays May Turn Mercury Into Gold

These experimenters have leaped into a world of the bizarre although not completely beyond the pale of possibility of achievement toward the end they are seeking. They have commenced work on a 5,000,000-volt X-ray tube which may eventually lead to the transmutation of elements, which might be taken to mean that gold can be made from mercury—the resultant social revolution would be obvious.

Dr. Francis Carter Wood, Director of the Institute of Cancer Research of Columbia University, is dubious about the therapeutic wonders which are being ascribed to the high-voltage X-ray tubes, but he readily acknowledges the great mercantile uses now in vogue.

"The use of high-powered tubes will be relegated to the making of pictures through thick or dense materials," he explained to the representative of MODERN MECHANICS AND INVENTIONS who was making a survey of the recent marvels of the X-ray, "and, of course, these large tubes are interesting for atomic research.

"But it is perfectly impossible to use such high voltage at present in the treatment of cancer because of the effect on the patient."

In the steel industry the use of the X-ray to detect interior flaws has become a wide practice. So-called doctors of metals are constantly diagnosing large steel castings to determine whether there are any defects which may prove fatal. These steel clinics disclose the ability of the steel to stand any great stress and to insure that it will not fly apart under the strain to which it might be subjected as part of a big machine.

Plane Structure Examined With X-rays

All aircraft metal is now radiographed, that is, subjected to X-ray photography, to trace possible flaws which may prove disastrous.

It was commonly known that all the steel forgings of the cup defender "Enterprise"

were exposed to the penetration of the X-rays before they were set in place.

Scientists at Cornell University not long ago changed the character of a plant by means of the X-ray, transforming an annual wild corn into a perennial. A single shot of X-rays is described as causing this change virtually overnight.

Dr. Thomas O. Menees, of the Blodgett Memorial Hospital, Grand Rapids, Michigan, has developed an X-ray photographic method whereby he can determine the sex of a baby three months prior to its birth. A solution of strontium iodine is placed around the unborn baby and after an X-ray photo is taken, features of the baby can be identified.

How Fake Paintings Are Detected

In the world of art the X-ray has come to play a significant part in recent months. The Metropolitan Museum of Art in New York City maintains a special department where paintings and sculptures are examined for their genuineness under the X-ray scrutiny. Alan Burroughs, X-ray expert of the Fogg Museum of Harvard University, is a noted scholar in this branch of the X-ray application.

Even mummies and other relics of antiquity are examined by means of the X-ray before their purchase is decided upon by museums.

Two scientists recently reported that they produced a hunch-back on a water-flea by bombarding it with X-rays. They reported that they would continue their experiments in the belief that the X-ray will yield secrets of evolution. Scientists working in the field of the cosmic rays are hopeful of learning creation's story.

There is another school of scientists which is working in another direction. Their experiments deal with the rays and vitamins. Fantastic as it might seem, their ultimate goal is to be reached on the day when a single pill will compactly contain a day's food rations, when food will actually be reduced to the necessities for bodily sustenance and not a form of pleasure, and a luxury, as the gourmands regard it.

Thunderstorms Operate 16,000,000-Volt Tube

Meanwhile, two German physicists, Dr. F. Lange and Dr. A. Brasch, are harnessing the electricity of thunderstorms to a new type of X-ray tube. Sixteen million volts have been captured from storms that have played around Swiss-Italo twin mountain

(Continued on page 188)

Above is shown patient taking treatment for cancer with new million-volt tube at California Institute.

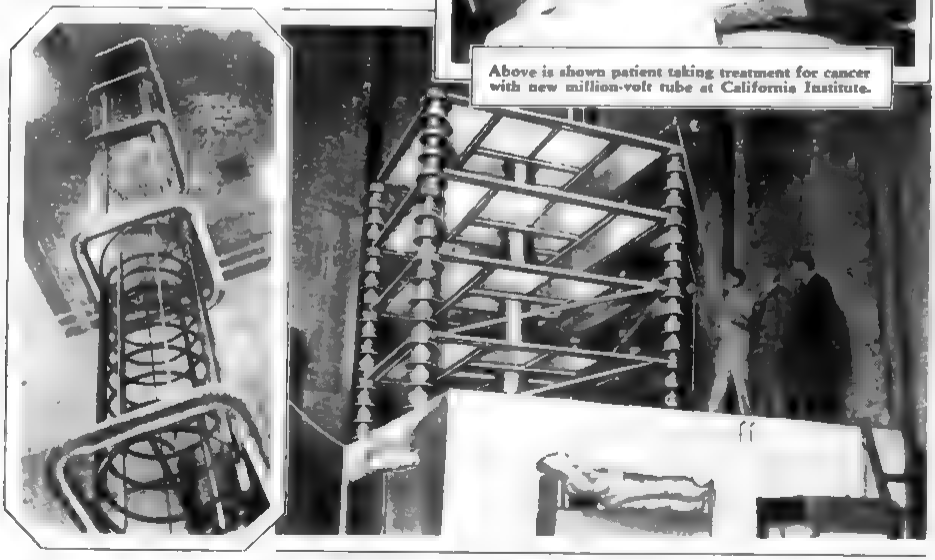


Photo at left above shows the water cooling column for the new 1,000,000 X-ray tube, world's most powerful, soon to be installed at California Institute of Technology. At right is seen the upper section of the new tube which supplies radiations for treatment of cancer equal to $12,000,000 worth of radium. Dr. Laurmsen, builder, is discussing tube with friends.

All-Metal Containers Speed Shipment of Bulk Freight

Transportation of cement, sand, and other such commodities is facilitated by use of these new all-metal steel containers, now employed by railroads. Cranes quickly transfer containers from railroad cars to freight depots, as shown above.

TO EXPEDITE the transportation of freight in bulk, particularly cement, sand and other such commodities, an eastern railroad has adopted a new type all-metal container, shown in the photo above.

This method provides shippers with movement of less-than-carload lots on a schedule comparable to that of carload lots. The sections holding the shipments are transferred quickly and cheaply by means of cranes.

New Stop Signal for Police Cars

New light flashes stop command to motorists on the road

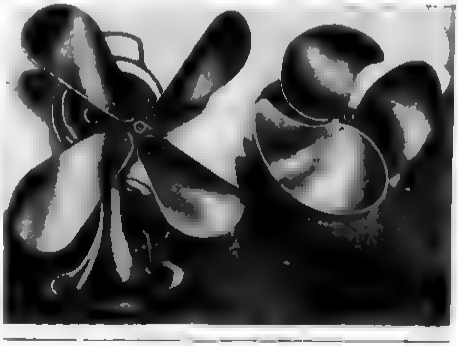
STATE police in Michigan have adopted a new departure in stop signals to supplant the familiar flashlight command when halting a motorist on the road.

The scheme makes use of a regulation automobile headlight mounted on the right front fender of the police car. The lens is lettered with command to "stop," as shown in the photo. In operation the police car drives up beside the culprit motorist and switches on the signal, thus commanding by light.

Fan Blade Has No Noise, Vibration

NOISE, vibration and other unpleasant features of the ordinary electric fan are eliminated in a new blade recently invented by Prof. Walter L. Upson, of Washington University School of Engineering, at St. Louis, Mo.

The shape of the new blade may be seen in the photo below. It is claimed that this shape makes the fan far more effective as a breeze producer than the ordinary household instrument. The collar with which the new fan is equipped is similar to other collars so that any motor is suitable. The fan will soon be on the market.



Here is shown the shape of the new noiseless and vibrationless fan blade in comparison with the old style blade. An ordinary fan motor may be used with these blades.

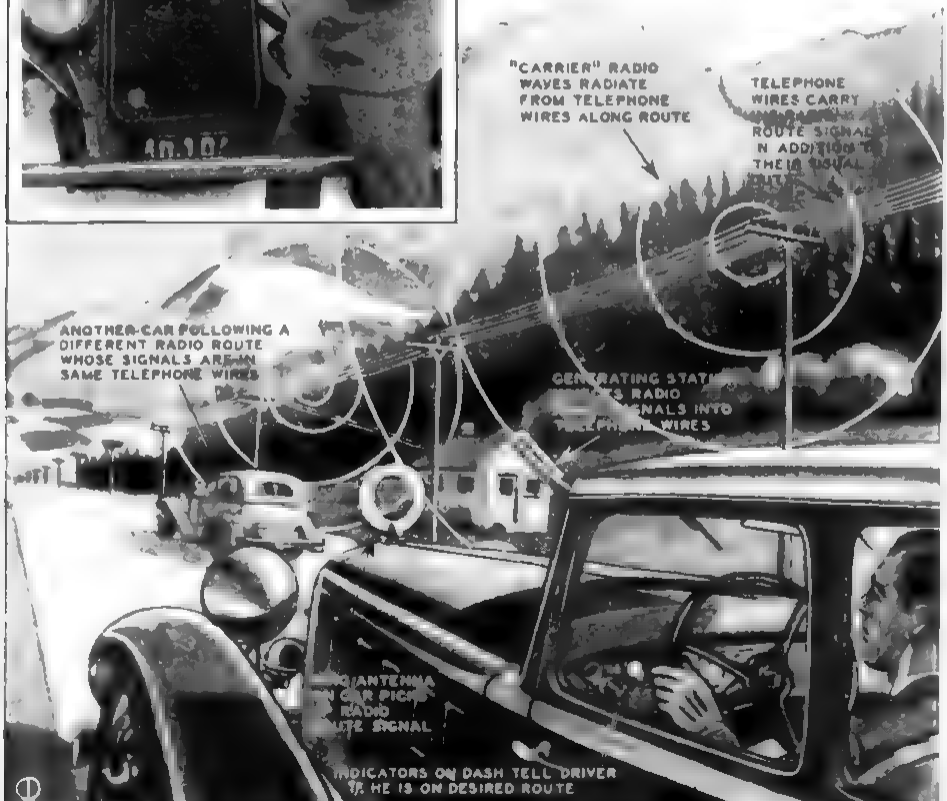
Tourists Can't Lose Road in Radio Guided Automobile

AUTOMOBILE tourists still get lost, especially in states where the road marking is poor and at night when various guiding signs are invisible.

A new system of direction finding will banish all of that. In the future the auto tourist, rolling along in strange country, will hear an alarm on his dash sound when he gets off the right road for each great national highway will then have its set of code signals flowing through the telephone or telegraph wires at the side of the roads by means of carrier waves.

Carrier waves are really radio waves that have been made to follow wires instead of being released in the ether. They follow such wires with dog-like persistency and set up powerful electro-magnetic fields about the wire.

A special antenna mounted on the hoods of cars pick up these powerful electro-magnetic waves and convert them back into electric currents. An automatic signalling device driven by a small electric motor interrupts the carrier currents and produces a signal characteristic of the road being travelled. After the signalling device on the dash of the automobile has been set to respond to a certain definite code combination, any deviation from the road to which the device has been "tuned" will ring a tiny bell.



Method by which carrier waves, traveling along telephone wires, can furnish signals to keep motorist on predetermined highway route, is shown above. Insert photograph shows antenna on hood of experimental car, for picking up signals.

This Indoor Rowing Machine Provides Artificial Current

The Yale varsity crew in training in the modern rowing tank installed in the new Yale gym. The current of water may be regulated by the coach to simulate real conditions.

YALE'S new Payne Whitney gymnasium at New Haven, Connecticut, was unofficially opened by the varsity crew which, under the direction of Coach Ed Leader, took to its oars in the rowing tank.

This tank, which is hailed as a triumph in engineering skill, is about 60 feet long. At each side of the built-in shell there runs constantly about ten feet of water at a speed regulated in accordance with the will of the rowing coach, who has only to press a button to accelerate or reduce the speed of the current to simulate outdoor conditions.

Finds Universe Built of Waves

ANOTHER proof that the whole universe is constructed out of some mysterious kind of wave or vibration, finer in structure than the supposed ultimate particles of matter such as atoms, has been obtained by a Japanese physicist, Dr. Y. Sugiura of the Tokyo Institute of Physical and Chemical Research.

The electric particles called protons, which combine with electrons to form all known kinds of atoms, have been proved to have the properties of waves, just as was proved several years ago for electrons.

A New Self-Leveling Golf Club

This driver has a small level mounted into the base of the club. It is easily seen.

THE duffer is a perennial gold mine for inventors. If you don't think so, just drop into any sporting goods store and ask to see all the gadgets designed to increase the golfer's efficiency.

The latest is a driver which has a small level mounted into the head of the club, which can be easily seen when the ball is addressed, and which will tell you whether or not the club is held straight.

"People Who Live in Glass Houses"

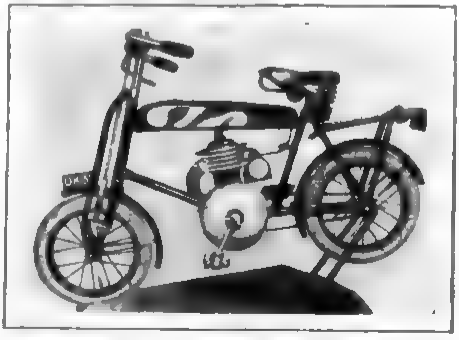
THE hand which shows through the brick at the right is not that of a magician, but is that of James Bigley, engineer of the Syracuse Lighting Co., holding one of the sample bricks which will be used in the company's new office building in Syracuse.

The pressed glass bricks are described as being longer than the usual red or yellow clay varieties.

Glass bricks for office buildings admit plenty of sunlight.

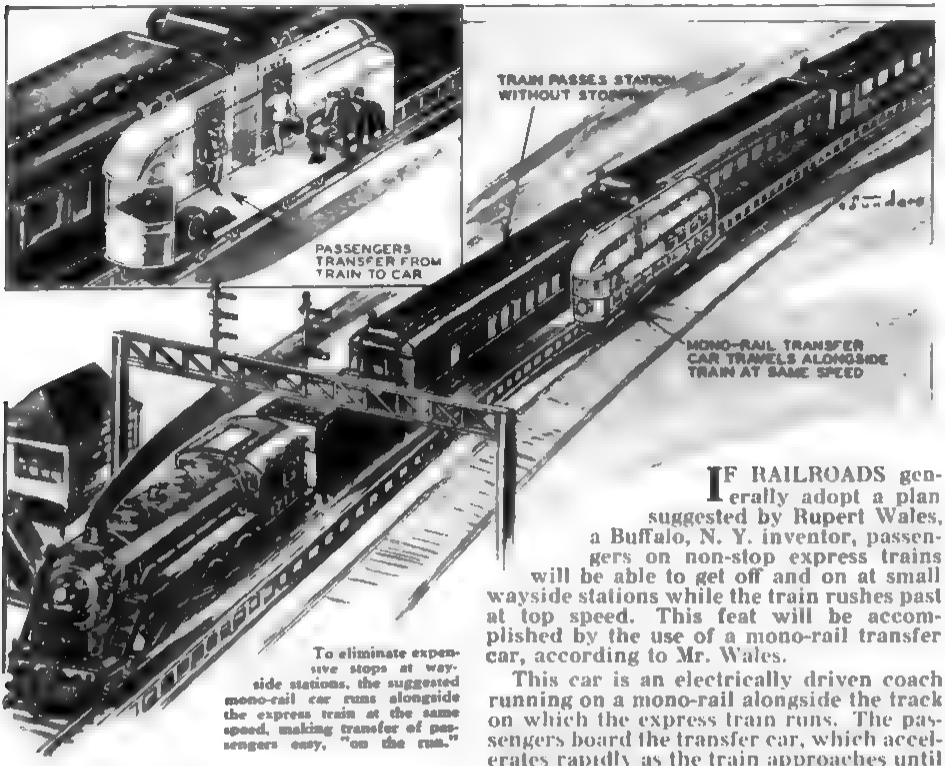
Bike Disguised as Motorcycle

WHAT is this younger generation coming to? When you and I were kids a bike was a bike, and lucky was the boy to get one without any trimmings whatsoever. But now look! Even the tiny tots must have a bike, and an ordinary one won't do. It must be designed as the Graf Zeppelin, or in this case, a real motorcycle.



With a built-in motor of light metal, this kid's bike resembles a real motorcycle. Note the imitation cylinder.

Train Picks Up and Drops Passengers Without Stopping



To eliminate expensive stops at wayside stations, the suggested mono-rail car runs alongside the express train at the same speed, making transfer of passengers easy, "on the run."

IF RAILROADS generally adopt a plan suggested by Rupert Wales, a Buffalo, N. Y. inventor, passengers on non-stop express trains will be able to get off and on at small wayside stations while the train rushes past at top speed. This feat will be accomplished by the use of a mono-rail transfer car, according to Mr. Wales.

This car is an electrically driven coach running on a mono-rail alongside the track on which the express train runs. The passengers board the transfer car, which accelerates rapidly as the train approaches until the speeds of the two are equal. The mono-rail car is then automatically clasped to the side of the Pullman, passengers get on and disembark from the train, and when all is in readiness the transfer car disengages itself from the train and slows down, returning to the station under its own power.

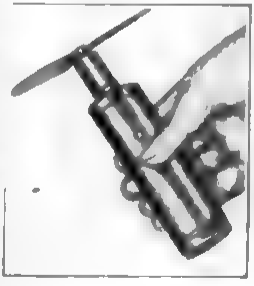
Gunpowder Drives Rivets

GUNPOWDER as a source of energy for driving rivets, splicing electric cables, and similar uses is now available to industry. A device known as the Temple gun, from Robert Temple, of Denver, its inventor, fires a .38 caliber cartridge whose force is delivered through the end of the gun as a hammer blow. The device uses a special type of cartridge.

A single blow from this 14-lb. gunpowder riveter is sufficient to drive a rivet through a ¾-inch steel plate, as shown.

Fan Sprays Perfumed Air

FROM Germany comes an invention to banish the discomfort of summer heat. It is a tiny fan, run by an electric motor and batteries, which generates a cooling current of air. The airstream, moreover, is delicately perfumed, the fan blades drawing the scent from a hollow metal tube inside body of device. The entire unit, as may be seen from the accompanying photograph, is small enough to fit conveniently into a purse or pocket.



Tiny fan operates from a dry cell and scents the air current from perfume well in its base.

World's Strangest Museum

Watching this ping-pong ball float in mid air, without any visible means of support, visitors to the new Museum of Science and Industry, Chicago, get more vivid proof of the Bernoulli principle. Ball is really held up by air jet from glass nozzle as illustrated in upper right drawing.

To get understanding of principle of angular momentum on which the governor works, visitors stand on this turntable and hold weights, as demonstrated. When weights are held out with arms, revolutions decrease; when weights are lowered, speed increases. Governor is seen in drawing.

by **JAY EARLE MILLER**

CAN you, off-hand, describe Newton's second or third laws of motion, explain the Bernoulli principle or say whether a noise could exist in a vacuum?

Those little problems, and scores more like them, are being answered in a practical way with working models in an unusual new museum at the University of Chicago.

In the spring of 1933 the museum equipment will be moved into the great new Rosenwald Industrial Museum—and, along with thousands of other working models, will be thrown open to the public.

Models Illustrate Newton's Law of Motion

You may not remember Newton's second law of motion, dealing with the transfer of momentum, but once you spend a few minutes playing with the working model it will always stick in your mind. For that model is a simple framework holding ten one-inch steel balls, suspended by "V's" of thread from an overhead frame, so that the balls are in line, and touching each other.

Draw one ball back, release it, and what happens? Many of the freshman students in the new physics course expect the other nine to be displaced, but nothing like that occurs. Instead, the tenth ball, down at the other end of the line, bounces out, falls back, and the transmitted shock of its return reacts on the first ball.

Draw two back and release them, and the pair at the other end are displaced, three and the end three move and so on.

Across the way is an eight-foot, horizontal wheel, with a toy railroad track on its outer rim, carrying an electric locomotive. Press the starting button and the locomotive starts around the circle in one direction, but the track and wheel begin to move backward in the other.

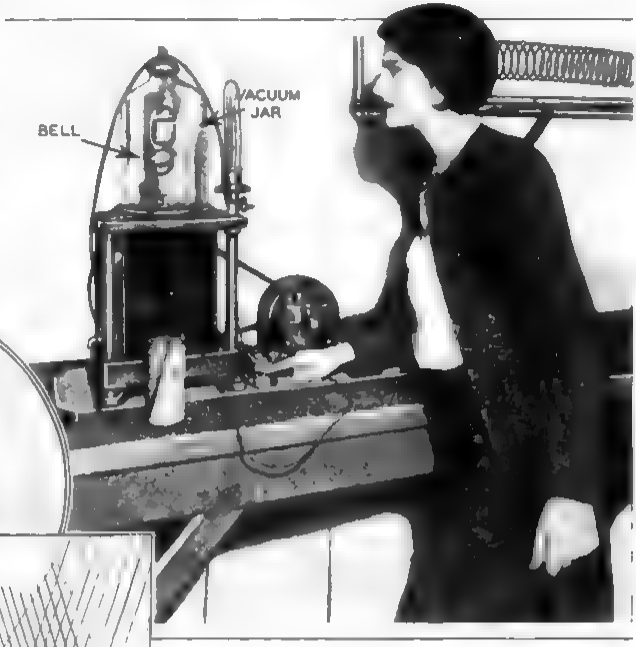
Toy Trains Work Out Newton's Third Law

For Newton's third law says that to every action there is always an equal and contrary reaction. Reverse the current a few times with the switch, and at each reversal the track gets an added backward kick until soon it is traveling one way almost as fast as the engine moves in the other.

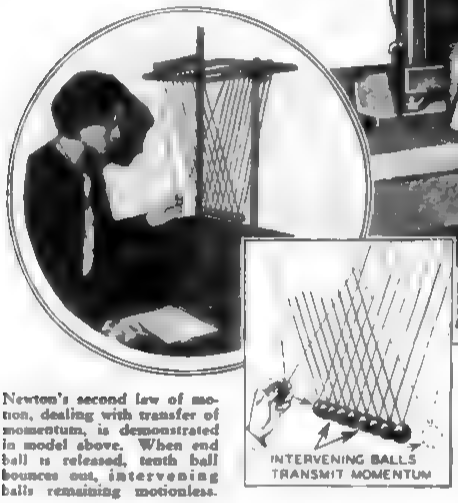
A chart on the wall calls attention to other examples of the same phenomenon.

Makes SCIENCE Fascinating

In this article you are taken on a verbal tour through the new Rosenwald Museum, Chicago, where $3,000,000 worth of working models make scientific principles vivid and fascinating for you.



Proof that a vacuum cannot transmit sound is given with museum apparatus shown above. As air is pumped out of the vacuum jar, the ringing of the bell becomes inaudible.



Newton's second law of motion, dealing with transfer of momentum, is demonstrated in model above. When end ball is released, tenth ball bounces out, intervening balls remaining motionless.

One is the tug of war, in which action and reaction are equal so long as the two teams remain stationary.

Another is a big railroad gun. Because of its small mass and inertia the shell leaves at high speed, while the great mass of the gun absorbs the reaction with comparatively small hydraulic shock absorbers.

A third is a fisherman stepping out of his boat. As he puts one foot on the pier and lifts the other he gives the boat a backward push—a scientific fact that has spilled many an inexperienced boatman. All of these examples are covered by the dry and dusty statement formulated by Newton long ago, but in the new museum they actually live and mean something.

Student Becomes Human Governor

A student steps on a small metal turntable and picks up a pair of three kilogram scale weights. The attendant gives a slight push and the student starts to revolve. Then she extends her arms, with the weights, at full length, and immediately slows down. She drops her arms, and speeds up.

Just a human governor, the prototype of the ball governor used on engines for generations. But after that museum experience there can never be any question in her mind why the principle of angular momentum works.

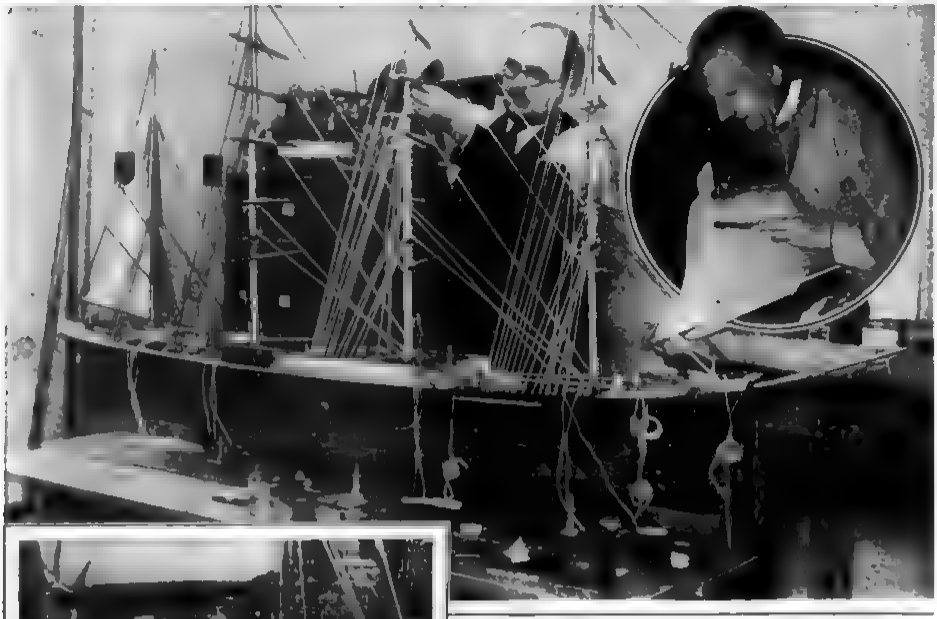
A crowd of boys flocks around the brake test machine. There's a heavy flywheel with a brake band attached to recording scales, a crank to turn it, an electric clock with large second hand to count off the minute, and a chart showing the number of revolutions and scale reading for an average man, a strong man and one horsepower.

A complicated arrangement of glass tubes and liquids illustrates Bernoulli's principle, that, in a moving liquid pressure corresponds to energy and velocity to kinetic energy. Since the total energy, potential plus kinetic, is constant, the velocity is greatest when the pressure is smallest.

Can you remember that? But when you step to the next exhibit and see a small ping pong ball floating in the air on an air stream projected from a glass nozzle at an angle of 45 degrees it all becomes clear, and unforgetable.

Cut-away Engine Shows Working Parts

A Corliss engine, a steam turbine with herringbone reduction gearing, and a Liberty aircraft engine, all cut away to show the working parts, the turbine driven by compressed air and the other two by elec-



Here are craftsmen at work on the model four-masted bark "Pamir," in the shops of the Museum of Science and Industry, Chicago. Thousands of tiny rivets were used in constructing the steel hull, while more than 2,000 tiny blocks went into making of rigging.

Above is a view of the poop deck of the model four-masted bark "Pamir," looking forward. Taffrail, spanker boom, binnacle, bits, etc., are all modeled on ¼" to 1' scale.

tric motors, form a working exhibit of power generation.

In one of the rooms a small model of Old Faithful and the other Yellowstone park geysers erupts every six minutes. It is made of galvanized iron, a tall, slim cone, well insulated, sitting on a tiny electric stove, with a broad, flat pan at the top to catch the falling water.

Model Shows Why Old Faithful Spouts

Because of the comparatively great depth of the water it becomes super-heated at the bottom, and then, when the top layers begin to steam and bubble up, the rapidly expanding steam from the over-heated bottom portion ejects the geyser.

A small brass weight and a large hollow brass ball, both weighing the same, and suspended from the ends of a scale beam under a bell jar from which the air can be exhausted at the turn of a valve, stumps many students.

When the air is pumped out the ball end of the scale arm sinks, despite the fact that both ball and weight weigh the same. The answer is closely associated with the problems of ballooning and lighter-than-air craft, for while the ball and weight appear to weigh the same, in air, that is not actually true, and the apparent weight of the ball is its true weight, less the support given by the air to its larger surface. When that support is removed in a partial vacuum the ball proves to be the heavier.

Vacuum phenomena are a continual surprise to the students. They see readily why a toy balloon under a bell jar grows larger when they open the valve and let the pump exhaust the air around it, but the electric bell in a jar is a continual source of amazement.

You Can't Hear Through a Vacuum

This bell can be started ringing, and then, as the air around it grows less and less the sound gradually fades, and finally ceases altogether, when there is no longer sufficient air in which to set up sound waves.

Complicated experiments of the late Dr. Michelson in the measurement of the velocity of light, X-ray apparatus, crystal structures, and a host of other scientific phe-

What a mine looked like in the days before steam engines is seen in this model of ancient mine shaft. Power to hoist coal to surface was furnished by horses operating carousel. Extensive investigations furnished dimensions for building it.

nomena are demonstrated by simple working apparatus.

Attendants are available to answer questions, but, under the new system whereby every student, regardless of plans for the future, is required to take groundwork courses in four sciences, no information is volunteered.

Museum Occupies 5½ Acres of Space

When the new Rosenwald museum opens in the spring of 1933 its 580,000 square feet of a floor space in a great five and a half acre building—often described as the most beautiful structure in America—will become the laboratory for the university students, as well as a museum for the public.

The rebuilding in enduring stone of the old Fine Art Palace of the world's fair of 1933 has been completed, and contracts have been let for the interior. When the doors are opened to the public the reconstruction will represent an investment of $6,000,000 and there will be $3,000,000 worth of working models on hand.

Models Work of Large Crew of Experts

A large crew of model experts has been at work for three years in the model shops of the museum building the equipment, and already several storage houses have been filled with completed models.

So far as humanly possible every model will do something. Huge ship models, perfect in every detail, will not be just housed

Models for every type of ancient and modern ships are to be seen in the museum, including even this Viking ship which plied the Northern seas about the year 1100 A. D.

in glass cases, but will be mounted in dry docks, which can be operated by visitors through a system of switches, or on marine railways.

Rooms and sections will trace the development of each field of science and mechanics from the dawn of history down to the present. In one alcove, for example, a reproduction of an alchemist's laboratory of the middle ages will face a modern chemical laboratory.

A section on bridge building will open with the earliest types of wooden, stone and bamboo bridges (the latter scale models of famous Japanese types) and close with the latest thing in suspension and bascule bridges, and the bascule models will be electrically operated.

Panama Canal Model to be Shown

Alongside a working model of the Panama canal will be an actual section of the old Las Cruces trail, the cobble stone high-

way built across the Isthmus by the Spaniards.

Because heat, as the basis of all power, plays such an important part in industry, the museum's boilers and power plant will be one of the working models. The floor will be cut away in the huge rotunda under the central dome to expose four boilers and the power plant, all spic and span, with stairways so that visitors can inspect their workings.

A complete section of a full size coal mine is being built in the basement, so that visitors can wander through the galleries and see mining machinery in its native habitat. The tall steel shaft of a coal tipple rises in one of the main wings, and visitors to the mine will descend to the workings in a real coal mine hoist.

Every type of vehicle from the earliest invention of the wheel down to the present is to be shown. An old Concord stage coach, an early Orient motor buckboard, a Gardiner-Serpollet steam automobile from Germany, and an ancient cable car are just some of the many full sized exhibits already stored in the warehouses.

Models Actual Copies of Originals

The models for the museum are not just reproductions, but actual copies in the materials and using the construction methods of the original, so far as possible. A six-foot model of the four-masted bark "Pamir" recently completed used thousands of tiny rivets in the steel hull and more than 2,000 tiny blocks in the rigging.

An exception to the rule of using original materials is a model of an ancient Japanese bamboo bridge. It was possible to get small bamboo of the proper diameter, but the rings in small bamboo are just as far apart as in large, so the model would not have been correct. The difficulty was solved by turning dowel rods down and leaving rings spaced at the proper distance for the scale of the model.

With the opening of the museum, just a month before the coming Chicago world's fair, the city on Lake Michigan will have four of the greatest public attractions in the country—the Field Museum, with its $50,000,000 display in natural history, the new Shedd Aquarium, recently described in MODERN MECHANICS AND INVENTIONS, and the Adler Planetarium, only one of its kind outside of Europe, being the other three.

Models Give Students Enthusiasm for Science

High school students will find their classroom studies far more interesting when they have gone through this remarkable museum. With the various models demonstrating the scientific principles in a graphic and unforgettable manner, physics and chemistry will take on a new life, so that students will bring new enthusiasm to the classroom.

The history of mechanical inventions also takes on an added interest when models of devices are seen in operation.

Here is model of early lumber sled to be seen at the Chicago museum.

This model of modern tug boat, designed with utmost fidelity to detail, gives visitors an idea of the construction of the sooty little vessels which dock ocean liners in the big ports.

The early form of the suspension bridge, using timbers instead of cables, is preserved for posterity in this model.

Above is shown a model maker at work shaping capstan, cabin and binnacle for a model sailing ship in the workshops of the museum. Finest craftsmanship goes into the construction.

Blind Can Now Read Printed BOOKS

ORDINARY printed books can now be read by the blind, thanks to the genius of M. Thomas, a French inventor, whose remarkable device is illustrated on this page. Photo-electric cells, which, as is well-known, are sensitive to light, hold the secret of the machine's operation.

The book to be read is placed on a moving carriage beneath a lens, and the page is illuminated by a powerful lamp. Suppose that the word being read contains the letter "R," which is used as an example in the accompanying drawings.

How the Letters Are Read

Light rays pass from the "R" through a lens and are thrown upon a mirror which in turn projects the rays onto a panel of 42 photo-electric cells, arranged like a checkerboard. Certain of the cells, it will thus be seen, are thereby darkened by the shadow of the letter. All that remains, therefore, to convert this shadow into something which can be read by a blind person, is to make the cells register themselves in tangible, "touchable" form.

This is accomplished by having each cell operate an electric circuit comprising an electro-magnet with suitable relays. A touch-plate, corresponding to the checkerboard of 42 photo-electric cells, is perforated with 42 holes in the same arrangement, and through each hole runs a small metal rod, in much the same way as a piston in a cylinder.

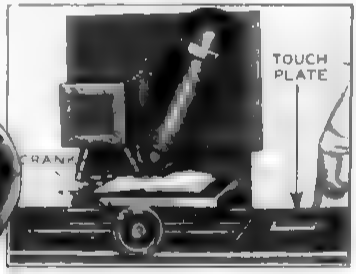
To get back to our letter "R," the particular photo-electric cells which have been darkened by the shadow of the letter actuate an electric current which sets the electro-magnets into action and results in certain of the metal rods being forced up through the perforations of the touch plate.

Blind man reading a book with the Thomas device. His right hand rests on touch-plate where he feels the letters.

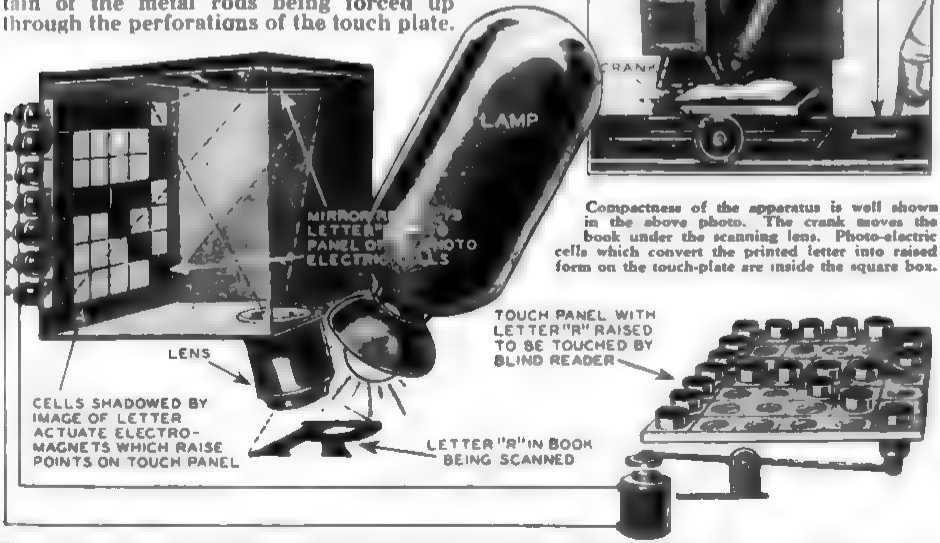
The rods thus raised will be the ones corresponding to the cells darkened by the projected shadow of the letter being read, and the blind reader is thus enabled to identify the letter "R" by feeling it take shape under his fingers.

The next step is to move the book on to the next letter in the word. A hand operated crank accomplishes this result. Each letter is read in turn until the book is completed.

If this explanation of the operation of the device sounds complicated, a glance at the drawing below will show that its principle is really quite simple.



Compactness of the apparatus is well shown in the above photo. The crank moves the book under the scanning lens. Photo-electric cells which convert the printed letter into raised form on the touch-plate are inside the square box.



This drawing makes clear the principle whereby the shadow of a printed letter, projected from a book or newspaper upon a checkerboard panel of 42 photo-electric cells, is converted into raised touch-points which can be read by a blind person. Electro-magnets, actuated by photo-electric cells, push up the touch-points, to be touched by blind reader.

Electric Shoe Shiner Is Operated by Placing Coin in Slot

Shoes may be shined in a few minutes by this machine. Polish and dauber are carried at the sides, while a nickel in the slot causes the brush to revolve for five minutes.

A NEW shoe shining machine, operated on any voltage or current and by either a toggle switch or coin in the slot, has recently been placed on the market.

The machine has no moving parts other than the motor, reduction gears and brush. The ¼ horsepower motor turns the brush at 290 revolutions per minute, which is the right speed for efficient shoe polishing. The timing apparatus can be set to operate from one to five minutes. Dauber and polish are carried in trays at side of the machine.

Light Me Up by Phone Some Time!

MERRIAM HOPKINS, Paramount motion picture star, has had installed at the studio a telephone which flashes a light instead of ringing the well-known bell.

This arrangement becomes necessary if a star or other picture employee expects phone calls while working in the sound-proof talkie studio.

A flashing light, instead of a noisy, ringing bell, calls you.

Dizzy Granddad Bequeaths Fault

A PENNSYLVANIA farmer who got dizzy whenever he looked down from a height has transmitted this peculiarity to no less than seventeen children, grandchildren and great-grandchildren, according to Eugenics Research Association of the University of Wyoming.

And Now It's Zippers on Hats

Dorothy Stone, daughter of the comedian and dancer, Fred Stone, wearing novel zipper.

THE newest wrinkle in ladies' headwear is a zipper attachment which is utilized for both ornamentation and head comfort. Patches of hair may now be seen through milady's hat when the wearer zips it open for comfort during warmer weather. Its creator, A. Kaner, predicts wide use of the new mode.

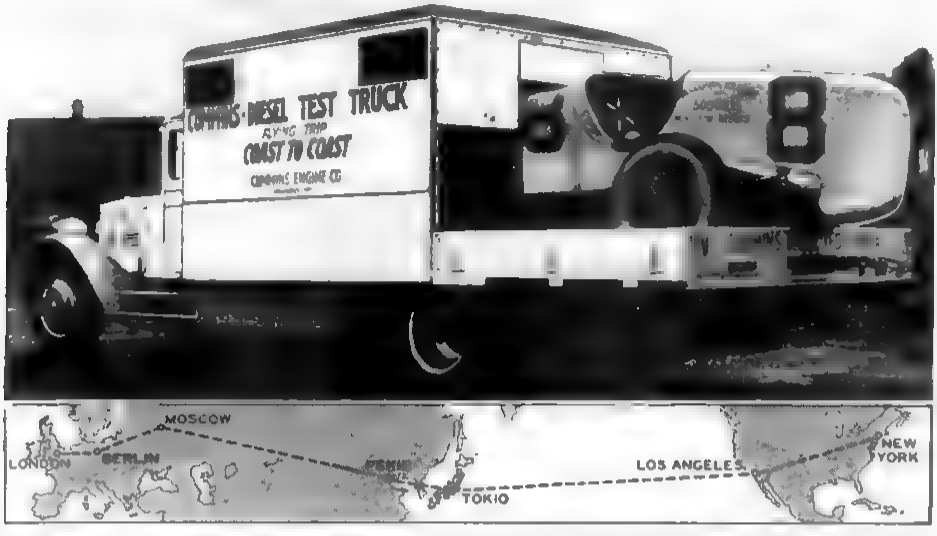
You Can Swat That Fly in Mid-Air

ONE of the many unique contraptions shown at the International Patent Exhibition in Philadelphia recently is the novel fly-swatter shown below.

This method of trapping the unwary fly is guaranteed to be much easier than putting salt on its tail. With this device flies can be killed on the wing.

No more stained walls with this fly swatter, and what's more, you don't have to wait for the pesky fly to alight.

DIESEL TRUCK Sets Non-Stop Record



Shown above is the Diesel engined truck as it appeared on its 3,214-mile cross-country journey from New York to Los Angeles. The average speed was 33.02 m.p.h., the total fuel cost, $11.22. In preliminary test conducted on Indianapolis speedway, the truck traveled 14,600 miles, amounting to distance from London east to New York, in non-stop run averaging 43 m.p.h., consuming 1,460 gals. of fuel oil costing $71.54. Gallon of lubricating oil lasted 1,825 miles.

TRAVELING farther than man ever traveled before in a non-stop journey on land, a crew of four men recently rode around the Indianapolis speedway for two weeks aboard a huge Diesel engined truck.

When the run was voluntarily stopped—the engine was still running strong on the last lap—they had covered 14,600 miles, the longest continuous land journey ever made.

At times during the fourteen day journey around the brick speedway the truck, weighing, with its fuel load, 21,000 pounds, reached a high speed of 72 miles an hour, and the average speed for the entire 14,600 miles, checked by official A.A.A. observers, was 43.397 miles per hour.

During the 336 hours that the engine ran without stopping, it consumed 1,460 gallons of fuel oil, costing but $71.54, and eight gallons of lubricating oil. Fuel cost less than one-half cent per mile.

C. L. Cummins, the designer of the first automotive Diesel engine, took the same engine which had been used in the race car at Daytona Beach in the winter, put it in a huge truck chassis, loaded his Diesel race car in the back for pay load, and started across the continent. Driving from the factory at Columbus, Ind., to New York, an official start was made from there, and a non-stop run made to Los Angeles, 3,214 miles away. The average speed for the entire trip was 33.02 miles per hour, and the fuel cost $11.22.

Phone Stand Has Midget Desk

AN EXTREMELY handy little telephone stand provided with two drawers and a pencil receptacle has just been placed on the market. Shown in the photo below, the stand is made from soft, live rubber which will prevent the phone from slipping from its anchorage. The top drawer is used for a telephone index and the lower one for writing orders or memos. The lower drawer is so braced that it can serve as a small desk. The stand can be used with either style telephone. A receptacle on the side holds a pencil.

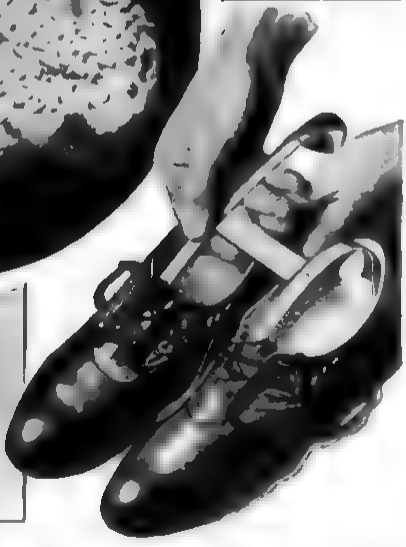
New desk telephone stand has two drawers, upper one for index, lower one for writing orders or memos. Made of soft, live rubber, the stand can't slide off the desk.

Household Tasks Simplified

This machine, operated by electricity, will wash and iron clothes, wash, rinse and dry dishes, scour pots and pans, polish silverware and sharpen cutlery; in fact, performs a multitude of household tasks. In addition it kneads dough or shakes cocktails, and serves on occasion as an exerciser and reducer.

Electricity has now ousted the traditional candle from its rightful place on the birthday cake and put electric lights on the job. Base of this new lighting system, shown at right, has twelve sockets fitting on bottom of cake.

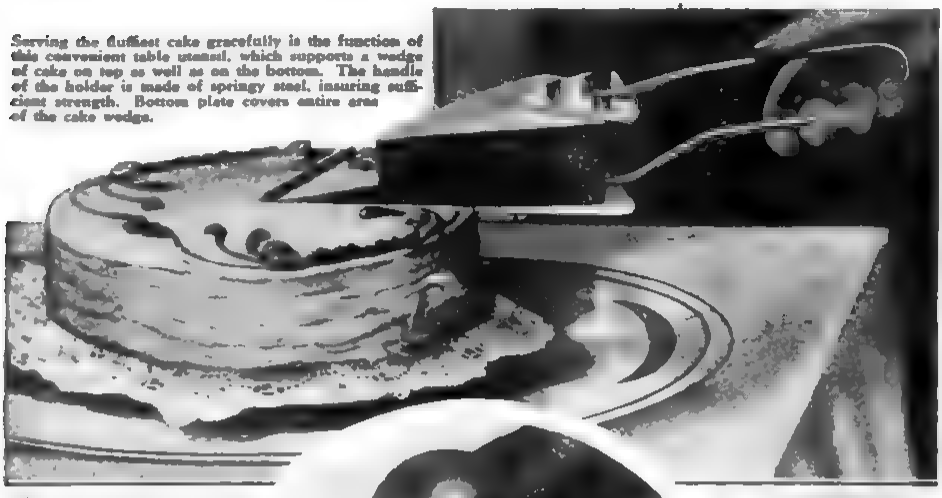
Suitable for removing anything from a bottle cap to a fruit jar lid, this contrivance makes use of a special steel cable which encircles the lid and which is drawn taut by an adjustable lever. Because the cable exerts even pressure all around, a positive grip is obtained without damaging the lid. Rear end of the handle is notched to form a bottle cap remover.



It is an easy matter to keep shoes of a pair together with twin shoe trees now on the market. Instead of being separated, the two spring steel trees are connected by a piece of metal firmly riveted in place. Shoes are thus held side by side.

With These New Inventions

Serving the fluffiest cake gracefully is the function of this convenient table utensil, which supports a wedge of cake on top as well as on the bottom. The handle of the holder is made of springy steel, insuring sufficient strength. Bottom plate covers entire area of the cake wedge.



Last word in novelty is represented in new salt and pepper shaker at right which looks like a light globe. It is made of frosted glass and weighted to stand upright

Considerable less muscle power is required in shining your shoes with this vibrating polisher. You simply wind up the key, then press lightly on the push button and the brush works back and forth to put on a good gloss. One winding session will operate the mechanism for twelve or fifteen minutes. On the top is a dabbler for applying the polish.

This new comb cleaner consists of a series of parallel threads attached to end loops of rust-proof metal. In use, one loop is hooked over a nail or other support and the other is grasped in the hand, as illustrated. The comb is cleaned by combing the threads back and forth the length of the threads, as illustrated above.

STRANGE PERILS *that*

This is what happened when gas from a leaking pipe was ignited in a house in Canton, Ohio, recently. Ralph Leppin, resident, was blown through the side of house to driveway.

A ten-inch shell from a burning lighter at Fort Hamilton, New York, plunged into roof of Brooklyn home, causing damage shown here. The shell went through two floors into the cellar, but, fortunately, injured none of the occupants.

by **ORVILLE H. KNEEN**

Headline disasters, such as mysterious fires, explosions, collapsing buildings, bringing sudden death to thousands of city dwellers annually, are the results of strange perils that lurk in unsuspected places. Why these disasters strike with such violence and abruptness is explained in this unusual article.

DWELLERS in cities large and small go about their everyday affairs in the utmost confidence that they are living in complete safety, little knowing, fortunately, that they are constantly menaced by innumerable strange perils.

Each year, statistics show, exploding gas mains, collapsing buildings, disabled airplanes, autos out of control on icy streets, and so on down the list to runaway elephants in circus parades—these unusual dangers take a heavy toll of lives of city dwellers.

Death Fog Sweeps Belgian Town

Rarely was a community ever so completely paralyzed with fear as was the Meuse Valley of Belgium. A poison fog swept in one December day, sending hundreds to the hospitals and killing scores. For days nearly all of western Europe shivered in fear under the same thick fog, densest and coldest known for years.

In the stricken Meuse Valley those with weak lungs or asthma could only gasp as

Confront CITY Dwellers

Sulphuric acid fumes from factory stacks, mingling with low-hanging water vapor, created deadly poison fog which brought death to hundreds in Meuse Valley, Belgium.

the clouds of deadly vapor rolled over the land. The pungent odor, along with the sudden death of many cattle, proved that some deadly gas was being carried by the fog.

Cause of Death Fog

A few weeks ago, after a long inquiry, a report was submitted by scientists that sulphuric acid fumes from various factories, mixing with the water vapor, dust and "toxic particles," had rendered the air poisonous.

Abnormal weather conditions had kept the air from circulating and prevented warming of the earth by the sun; frost kept the temperature down. The report stressed the "urgency of measures to protect the populace . . ."

Thus thousands of people are dependent upon the weather for life itself.

Chemical Plants Menace Towns

Gas attacks are only one phase of the hidden perils that hang over modern cities. The hazards of wholesale death are ever-present when multitudes of people are living close to chemical industries, power plants, combustible buildings and explosive materials.

Death-dealing forces in scientific laboratories sometimes burst their bounds. And the worst of it is that city-dwellers rarely think of being in danger.

Sections of road for a quarter of a mile in London were blown into the air recently, killing a horse, overturning a taxi and breaking up concrete as shown above. The underground explosion was believed due to leaking gas mains.

But the crowded city harbors, on every side, above and below, sleeping forces that, released on a moment's notice, are far more dangerous than the worst hazards of battle. The entire wiping out of a city is not only possible, but has occurred more than once since the annihilation of Sodom and Gomorrah.

Probably the worst single catastrophe of modern times was the explosion of the

Ninety-eight people were killed when the roof of the Knickerbocker theater, Washington, D. C., suddenly gave way and fell upon the audience, causing damage shown here.

Chemical plants form one of the greatest sources of danger. Photo above shows firefighters battling blaze caused by explosion of storage buildings of Stamford, Conn., plant. Static electricity igniting alcohol fumes caused disaster.

Baden Aniline Dye and Chemical Works, at Oppau, Germany. Over 1,000 were killed, thousands were injured, the town was wrecked and damage was felt for more than fifty miles.

Last year almost every citizen of Oradour-Sur-Vayres, in France, suddenly lost the power of speech. Many had strange fevers that did not yield to treatment. Few houses that did not have one or more cases.

Finally the mysterious plague was traced to arsenic in the wine, just sufficient to paralyze the tongues of those who drank it. All recovered, but the source of the poison was not found.

Our own epidemic of "jake" paralysis was far more serious. Tens of thousands of liquor drinkers in the Middle West were more or less paralyzed, but the original source of the obscure poison, found only in bootleg "jamaica ginger," was not discovered. Publicity, however, quickly stopped the supply. Thousands of the victims today are able to walk only with crutches.

Germs in Laboratories Form Deadly Hazard

Another sort of hazard was revealed in 1926, when a Swiss bacteriologist was working with a virulent culture of tuberculosis germs. Suddenly the glass container, under pressure, burst with a loud report, showering the scientist with deadly germs. Locking the door, he tore off his clothes and for hours burned his hands as he washed every part of the laboratory with antiseptic.

In London, test tubes containing influenza germs enough to start an epidemic were stolen from a doctor. Nothing happened, but it is disquieting to think what havoc unscrupulous persons might spread with such germs and bacteria.

Planes Flying Over City Endanger Life

Wholesale death from overhead was not much of a hazard until recently. Falling materials, planks, safes, and so on, usually catch only one or two persons. But we now have wider hazards from falling aircraft. In New York last year, when a spinning plane headed toward crowded Broadway, only chance landed the craft on a roof instead of among hundreds who thronged the streets.

Disabled Airplane Falling in City Endangers the Lives of Inhabitants

Airplane Cylinder Falls Into House

Recently a Negro maid in Harlem turned white when showered with plaster, as a terrific crash shook the house. A 25-pound cylinder had dropped a mile from an airplane which was later found by aerial detectives. It had lost a cylinder, a piston and part of the cowling, and made a forced landing in a small garden on Ward's Island.

Three weeks previously a pilot lost control of his machine when his motor went dead while he was looping. He lit with terrific force on the roof of a frame dwelling. The motor crashed through and landed on the dining room floor, missing two young people by inches. The pilot escaped with minor injuries. With less good fortune an entire family or even scores might have been killed or injured.

Disabled Blimp Kills 10 in Bank

In 1919, a 158-foot blimp with two 80-horsepower rotary motors burst into flames and plunged down into a Chicago bank. Gasoline flames were sprayed over the interior, ten employes were killed instantly or died later, and thirty more were injured.

Air laws are being enforced and will reduce such hazards to a minimum. But with planes and dirigibles carrying scores or hundreds on each flight, catastrophes can only be avoided by keeping aircraft away from cities.

But by far the greatest city perils come from underground. Modern cities, honeycombed with water pipes and sewers, electrical conduits, cables, subways, manholes, tunnels and passages and cavities of all kinds, employ thousands to run the underground cities and keep them safe. Sometimes they fail.

Houses Fall Into Excavations

Few cities are built on solid rock, as is the Manhattan part of New York. Some towns have had mining shafts and stopes driven directly under them. Springs, creeks and even small rivers, covered over by fills or buildings, have excavated large areas into which houses, apartments, factories, hotels, have suddenly or slowly sunk. Cities built on steep hills have had scores killed by sudden slides.

Considering the enormous amount of electrical cable and wiring underground, the number of short-circuits and fires is surprisingly low. In 1928 a burning cable filled a New York subway with choking

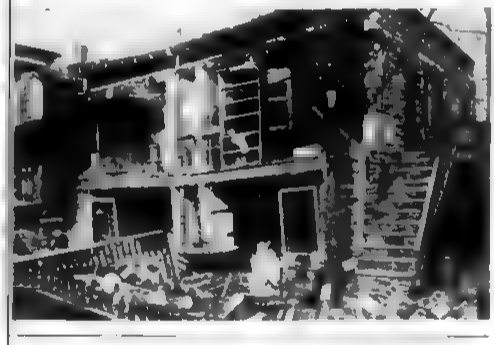
In 1920, wagon full of explosives, supposedly work of Reds, went off in Wall Street, killing 30. Above is seen remains of the wagon.

You can't even trust trolley cars. Top left photo shows what happened when one ran amuck in New York, demolishing entire corner of five-story building. Airplanes flying over city constitute a deadly menace. Artist's drawing at right visualizes what might happen if plane should catch fire and plunge uncontrolled into thickly populated section of city.

Leaky Gas Pipes Constitute Deadly Menace to Lives of City Dwellers

Leaking gas mains and stored T.N.T. were responsible for wreckage shown above. The disaster, occurring in thickly populated section of Chicago, killed 12 and injured 70.

Collapsing just as workmen tearing out interior were knocking off for the day, debris from front of this nine-story building in New York buried one person and killed five. The thunderous crash broke many windows in the vicinity.



The occupants of this four-family house in Scranton, Pa., were virtually tumbled from their beds at midnight when an abandoned coal mine cave running beneath the property fell in. Wood props were found to have been rotted away.

fumes, stalled a long train with about 3,000 passengers, and overcame hundreds before they could rush out to the nearest exit. A burst water main shortly afterward flooded subway tracks, and 89 were injured in the panic.

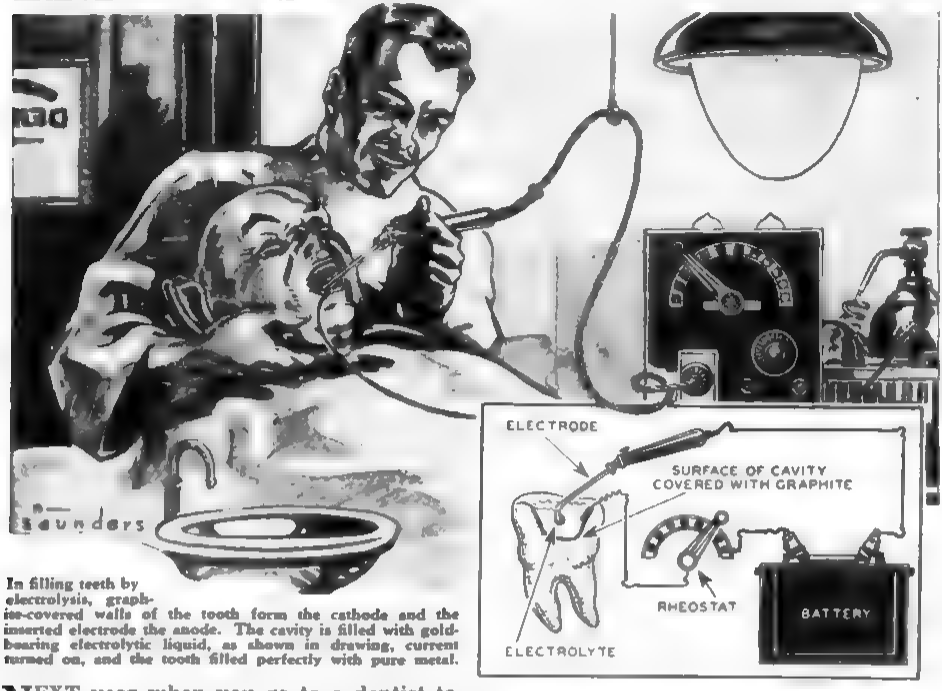
Spouting geysers fifty feet high, from high-pressure mains, have drenched pedestrians, flooded streets, and caused heavy damage. Boilers have exploded, releasing superheated steam in great clouds, and causing fires. Perils such as these are infrequent, however, and at worst affect only a small part of a city and a few people.

But a far more horrible, insidious and inescapable peril is that of poisonous gases. A vast number of chemicals are used today, and most of the plants are in cities, often in congested parts. Products that are safe enough in industry become terrible menaces to whole cities when released, as when a fire or explosion suddenly converts them into gas.

On May 20, 1928, two girls fishing from a rowboat near Hamburg, Germany, suddenly collapsed. Several hours later people and cattle on Wilhelmsburg Island, in the Elbe River, began dropping in their tracks. The wind shifted. Scores of men, women and

(Continued on page 186)

Have Your Next Tooth Filled Electrically!



In filling teeth by electrolysis, graphite-covered walls of the tooth form the cathode and the inserted electrode the anode. The cavity is filled with gold-bearing electrolytic liquid, as shown in drawing, current turned on, and the tooth filled perfectly with pure metal.

NEXT year when you go to a dentist to have a tooth filled he may connect the cavity up to a small dynamo and fill your tooth electrolytically with gold or silver, in the same way that metal articles are gold or silver-plated.

Dentists are working along these lines because the prevailing method of making gold inlays involves the use of wax impressions, which frequently are slightly inaccurate, leaving unfilled pockets in the tooth as a source of future trouble. Cavities would be coated with chemically pure graphite as an electric conductor, filled with an electrolytic liquid bearing a solution of a gold salt, and the current turned on to deposit a perfect filling in the tooth.

New Belt Buckle Has Secret Compartments for Money and Photographs

APPEARING to all outer evidence like the regular thing, a new belt buckle on the market has two concealed compartments for carrying money and other valuable objects. In addition, a photo of the wearer, or even his best girl, can be carried in secret, along with an identification card, as shown in the accompanying photo.

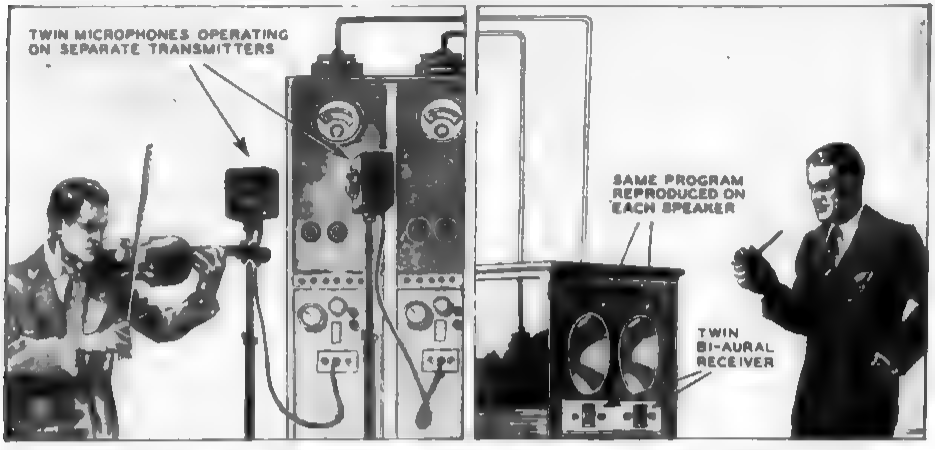
This new belt buckle has secret compartments which hold money or other valuable objects, as well as identification cards and photographs of wearer himself or his best girl.

Scientists Approve High Heels

REFORMERS who condemn high heels are themselves condemned in a recent scientific study reported to the Royal Society of Medicine, London. Instead of being unhealthful, high heels are actually easier on the body than low ones.

In spite of the present vogue of high heels, there is no evidence that corns, flat feet, or other disorders are increasing. Scientists have thus given heels over two inches high a clean bill of health.

Bi-aural Broadcast System Adds Depth to Radio Music



New bi-aural broadcasting method, which gives greater depth to tones, makes use of twin receivers and transmitters as illustrated in the above drawing. Same notes superimposed on each other are reproduced with utmost fidelity to original.

REASONING that since two eyes are required for stereoscopic vision, and that for this reason we are able to perceive depth, radio engineers are now proceeding to apply this principle to the aural perception via radio.

The fruit of their efforts has been a plan for bi-aural reception of programs over the radio. In this plan two receivers and transmitters operating on separate wave lengths, are employed.

At the transmitting end a pair of "mikes" pick up the musical sounds, while at the receiving end they are received over twin receivers, so that owing to the superimposition of one set or sounds on the other, a depth is obtained which makes the music far more pleasing to the human ear.

Sea Shell Used as Mute on Musical Horn to Produce Finest Notes

Unusual results are obtained with horn mute made from sea shell, replacing customary metal and pasteboard mutes.

SOMETHING distinctly new in the way of mutes for a musical horn was exhibited recently at the Annual Patent Exhibition held in Philadelphia.

This something new was simply a sea shell, but it is claimed that such a mute is far more effective than the customary metal or paper mutes.

Musicians witnessing a demonstration of the contrivance gave it their heartiest approval.

Why Past Exists in Present

A THEORY to explain the mysterious impression which almost everyone experiences occasionally, that something which he is doing or seeing has been done or seen before in exactly the same way was suggested by an eminent psychiatrist.

The experience is merely a mild symptom of a mental condition in which the automatic time sense of the normal mind is disordered.

The fundamental trouble is that things which are happening now and which therefore are represented in the mind by direct sensations, lose the firm sense of reality which such present things have for the normal individual, as compared with the more or less unreal ideas of past or future.

Adjustable Handles Give Serving Tray Many New Uses

INVALIDS and those who serve them will welcome the introduction of a new serving tray, made of light metal, which combines the features of several articles of furniture.

The adjustable legs, when turned above the tray, may be used for handles. Turned down, the legs support the tray at just the right height to convert it into a convenient bed-table.

Upon adjusting the angle of the legs, the table becomes a book rest. The legs may also be extended so that the tray may be placed across the arms of a chair.

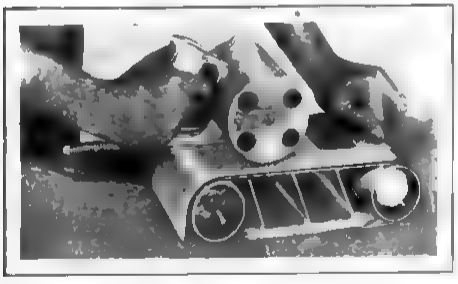
Especially suitable for invalids, this tray can be quickly converted into bed table by turning down adjustable handles.

Fire Flash Powder Electrically

Powder is fired by turning on juice from battery or 110 volts. Melting wire ignites the powder.

AN improvised gun to set off a charge of flashlight powders from a battery or a 110 volt line can be made by first screwing an ordinary connection plug into a socket having a flat base. Into the slits drive slender wood screws and around each of which is to be wrapped a piece of fine copper wire. Load the gun by pouring the powder onto the pan.

New Belt Type Sanding Machine



Used on wood, metal or stone, this belt type sander gives smooth finish by use of adjusting screw and flexible pad.

USED on wood, metal, or stone, a sanding machine of the belt type now on the market accomplishes perfect surfacing in all degrees of cutting without ripples. Extra smooth finish is assured through the use of a flexible pad.

One of the most important mechanical features of the new sander is the adjustment of the front roller on an eccentric shaft with spring tension which permits changing belts in ten seconds.

Why Striped Shirts Wear Out Fast

WHY striped shirts wear out faster than solid color ones is now explained by science. The trouble, it is found, is a chemical reaction, between some of the dyes often used for the stripes on shirts, the fiber of the fabric and the chlorine bleaching liquids often used in preparing the cloth or in laundries.

Magnifier for Triangular Scale

TO PREVENT eyestrain and to make possible more rapid work and greater accuracy on the part of engineers and draftsmen, George Kaler, a San Antonio, Texas, engineer, has invented a scale magnifier mounted in a chromium frame which slips on a triangular scale, and slides into position by a slight movement of the index finger, thereby eliminating the use of the small hand magnifying glass often used for the aforementioned purposes.

Magnifier to prevent eye strain on part of draftsmen is mounted on a chromium frame which slips over the triangular scale. Position can be changed with index finger.

Fortune Making IDEAS

Plumbers have need of an electrical fixture that will clean out sink traps in rapid and positive manner. Motor-driven vacuum pump will fill the bill.

Medicine manufacturers will pay huge sums to some inventor who will develop a bottle stopper that will automatically measure out one, two or three tablespoonfuls.

For want of a non-slipping tripod, high priced lenses are often broken to bits. A tripod that will stay put is in demand.

Fortunes await inventors who can discern mechanical needs of the public and fill them with simple, inexpensive contrivances. This month Mr. Yates gives basic specifications for six devices that will be immediately grabbed up by the waiting public, which will reward the inventor generously for his efforts.

ONCE again I feel compelled to mention the matter of brevity in correspondence. When you write to me it is not necessary to tell me that you are a reader of MODERN MECHANICS AND INVENTIONS and that you think it is the best magazine published.

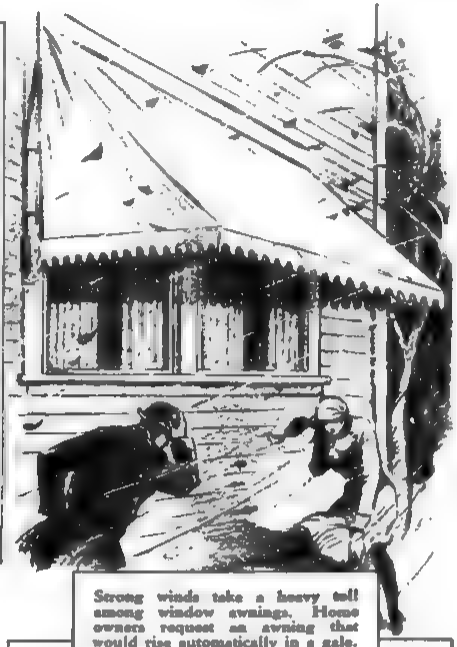
I know that you must be a reader or you would not be writing to me. And I know that you must think it is the best magazine published concerning the science of mechanics.

These confessions will not give any preference to your letters for I am in fairness bound to answer letters in the order in which they are received, always providing that they are accompanied by a self-addressed and stamped envelope.

for INVENTORS

by Raymond F. Yates

What motorists are in need of is a windshield wiper operated, say, by a solenoid, insuring continuous and positive action. Electricity fans should get to work on this.



Strong winds take a heavy toll among window awnings. Home owners request an awning that would rise automatically in a gale.

Instructions to Inventors Wanting Advice

Mr. Yates, who edits this department, always stands ready to assist Modern Mechanics readers with advice on patent and law procedure. But owing to the huge volume of mail, certain requirements must be observed. When writing always be brief and concise. A drawing is all that is needed, unless patent laws advice is sought. Models will not be accepted and will be returned to their owners. No letter will be answered unless it is accompanied by a stamped, self-addressed envelope. Foreign readers excepted.

1. *Self-Measuring Medicine Bottle*

Get your paper and pencil out and try this on your inventive piano.

Every year in the United States countless millions of bottles of patent medicine are sold. On each one of these bottles we find directions to take one, two or three tea or tablespoonfuls of the magic fluid which will cure anything from fallen arches to hangnails.

What is needed is a pressed bottle stopper of some kind that will automatically measure out the correct amount, one tea or tablespoonful at a time. That would be a real selling feature if the device was cheap enough so that it could be placed on every bottle sold. Then one might simply put the

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When both front and back door pushbuttons are connected to one bell, confusion often results. Electric fans should develop a bell that would have two gongs and one magnet, so that the housewife can tell at which door visitor is waiting.

What Magicians Do When

Mechanical ingenuity and high-speed thinking are required by magicians when something goes haywire with their tricks. Here Fred Keating, famous magic master, tells of some of his embarrassing moments.

What should a magician do when a needle gets lodged in his throat? Here Keating fails to get one of the needles off the chain, and is beginning to suspect that he might have swallowed it, while his assistant looks on delighted.

While Fred Keating, super-magician, is showing the famous bird trick to Maurice Chevalier, movie star, the Frenchman is surprised to see the bird disappear right under his nose. "Stop your Keating," exclaims Chevalier.

As told to George Bailey
by FRED KEATING

AT ONE time when Robert Houdin, patron saint of modern magicians, after whom the great Houdini adopted his name, was asked by the execution of what trick he judged a conjurer, he replied, "Never by the execution of any trick, but wholly by his ability to get out of a trick that fails, and covering it up."

I am going to tell you a number of episodes in the careers of many famous magicians of my time—and I am not quite 30 yet—where something went wrong either because of human error or mechanical blunder, resulting in embarrassment to the performer.

After all, it has always been held that the magician is merely an actor playing the part of a magician. The technique and the mechanics he uses are simply his tools in an art which he has come to master, either by practice or inherent aptitude.

Magic Is Simply Dexterous Trickery

I do not deny that I aspire, though secretly, to distinguish myself in my craft. There can be no limits to aspirations. And yet, I am not one who takes his magic too solemnly. I can find a wholesome element of humor in it.

Imagine the humiliation of a very dear friend of mine who used to employ a real hen in one of his tricks, for after all magic is nothing more than tricks dexterously and artistically executed.

This magician used to point out to me that an obstinate, clucking old chicken is no congenial assistant. He would make her disappear suddenly from a coop on a table which was solid and undraped, and reappear in a jiffy in a box across the stage.

Misplaced Cockerel Makes Trick Go Wrong

On this particular night I had been watching his act from the wings of the stage. He went through the first part of his trick in his customary nonchalant manner and confidently exhibited the empty coop to the audience.

Then he strode across the stage and opened the other box dramatically—and out stepped a fine young cockerel, and crowed lustily!

Long before the bellowing laughter of the audience had subsided that magician's assistant was fired. The cockerel should have appeared in a stunt later in the act.

Bird Cage Trick Baffles Audience

This reminds me of a little unpleasantry which happened to me in Boston not so long ago. For those who have not seen or heard about my featured bit of magic, I will explain that the name

Mechanical Tricks Go Wrong

Houdini, greatest enemy of the spiritualists, is here shown performing a stunt exposing the frauds of the so-called mediums. In duplicating a trick of the mediums, he has removed his shoes and is ringing the mystic bell under the table with his toes.

The famous Indo-Italian fakir, Blakaman, who was suffocated to death in a theater performance in Argentina when he had himself buried in a coffin for three hours.

Howard Thurston, the magician, showing the kiddies how to take the well known rabbit out of the well known hat at a party at which he entertained nearly 1000 children.

of Keating has become synonymous in recent years with the bird-cage trick.

In this "piece de resistance" I present a bird-cage balanced between the palms of my hands. Just an ordinary bird-cage. In it there is a canary. A real, live melodious canary. I can assure you that there is nothing illusory about these two factors.

Suddenly I clap my hands together and both cage and canary are gone! Right before your very eyes. Nothing remains in my hands, nothing goes up my sleeves. Anyway, this trick has had them baffled for a long, long time. Naturally I'm not exposing it, all the fun would be gone, for all of us.

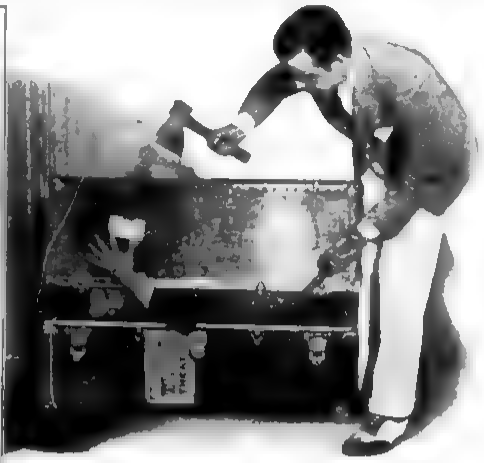
When Bird Cage Trick Went Wrong

But one night in Boston something went wrong with the works. Strangely enough it happened at a time when Florenz Ziegfeld, the famous Broadway producer, and I were haranguing about my bird-cage patent rights. He wanted to use the idea in his "Simple Simon" show. He was imitating my act with burlesque bird-cages which collapsed and slid up the sleeve.

That night I came out on the stage of the Boston theatre, and after apologizing as I always do in the theatre for my rude interruption, the moment came for my bird-cage scene. It was the high water mark in my performance.

I glanced suspiciously at the cage that was handed me, for I could tell from the

Houdini, the dean of magicians, is here shown being locked into a cabinet, with hands, feet and head clamped. He escaped with perfect ease, to the amazement of spectators.



Alexander in a tight situation, which might have resulted in suffocation. The key which opened the trunk was misplaced and Alexander had to be freed with a hatchet and crow bar. At the left, Alexander has accidentally dropped an expensive watch with which Keating was performing a trick—an embarrassing situation for all concerned.

"feel" that it was not my old friend. The bird was the same, but I could sense that the cage had been tampered with. I could feel a horrible thumping in my heart. I knew right well that neither bird nor cage was going to disappear, no matter what sort of abracadabra I used.

I could perceive the faint beads of perspiration coming to my brow. Plainly I was foiled. The big moment in my act, the trick by which I had gathered a fair measure of fame, was going to be a flop. Verily, it called for a great struggle to maintain my poise.

Trick Varied to Save Situation

After I got through a lengthy explanation of the bird-cage trick, it dawned on me to announce to the audience that I was going to vary it a little that particular night. I said I was going to treat them to a trick which was the latest I had perfected, which was the gospel truth.

Instead of making the cage and the bird disappear as I brought my hands quickly together, I was successful in causing only the canary to vanish. The cage remained intact and without any means of outlet. It made a tremendous hit and left my audience pop-eyed with amazement.

Someone Tampered With Cage

This is the first time that I am telling anyone of that potential embarrassing situation in Boston. I discovered later that someone had actually though adroitly opened my trunk and forced the top drawer in which the cage reposed, ostensibly to examine or copy it, though my trick has yet to be imitated. I mean the trick as I do it.

At one time the great Houdini had his thumbs locked in a pair of thumb-cuffs, the thumbs fitting into the clasps just as one might fit into a pillory. After the thumbs have been fitted, the cuffs are clamped down tightly.

Much to his surprise, Houdini discovered that some jokester had played a prank on him. The lock, which he might easily have pried apart, had been stuffed with sand!

Houdini Injured by Defective Lock

Houdini suffered in silent torture as he grappled with these little thumbcuffs, the smallest apparatus that he ever dealt with. As he struggled he concealed his actual feelings, keeping from his audience the fact that he was non-plussed. In the end he actually ripped the cuffs, still snapped, from his thumbs. That took him one whole hour.

As he re-appeared on the stage for his

Above—Much to Keating's annoyance, the Great Alexander forgets his part of the act as he falls into flirtation with a dame in the audience. Right—Keating senses that his disappearing bird cage has been tampered with so he covers up his embarrassment by making the bird alone vanish.

Something goes haywire with Keating's card trick, while Alexander looks on with a snicker.

bow, his hands were swathed in handkerchiefs. But he would not betray his feelings. He bowed and smiled and withdrew. He had to be treated by an ambulance surgeon. That night he was back on the stage for his act, omitting the thumbcuffs number.

At another time there was another eminent magician who used to execute what he called the "Phantom Dancer" number. He would waltz to the center of the stage with a pretty girl and then suddenly she would vanish like mist before the sun.

Trick Failure Ruins Magician's Career

At the very critical moment, something went haywire either with his physical maneuvers or the mechanical works. Nevertheless, she failed to disappear as he reached midstage.

He immediately became disconcerted and showed it in quite a pronounced fashion. He wrestled and tussled with his lady assistant until it seemed that he was on the verge of committing assault and battery. Boos, catcalls and what we thespians jokingly refer to as the "Bronx cheer" accompanied his vain efforts.

In the end the curtain was rung down, simultaneously marking the end of this conjurer's career. He became so unnerved by the incident that he lost his courage. You see he was not a disciple of Robert Houdin.

Youth Uses Tricks in Church

Jasper Maskelyne, the noted British magician, tells of an embarrassing time he had once when a small boy asked him to teach him a trick. He taught the lad to make a penny disappear and reproduce it from behind his ear. The very genial Mr. Maskelyne forgot all about the lesson he gave the boy until he got a letter from the child's parents a week later.

It seems that the youngster worked the trick with the penny given him for the basket at church. A solemn deacon held out the canister and the boy created quite a local sensation by making his penny disappear and then, after a short, frenzied search, he dramatically produced it from his ear, and put it into the basket.

"And it was all blamed on to me," says Mr. Maskelyne.

At another time my very esteemed friend, Arthur Train, the novelist and himself a rabid lover of magic, asked me to join him at a dinner given by an austere Park Avenue society lady for a group of literary personages. Mr. Train, given the privilege of inviting a compan-

In the photo above, Thurston is shown directing stunt in which Chandra Bey, Hindu prince, is submerged under five feet of water in air-tight glass tank. At right—Thurston hypnotising Chandra Bey preparatory to burying him for an hour in coffin to demonstrate power of suspended animation.

ion who might add a little color to this seance, had selected me.

He warned me that the hostess was a woman of extreme catholic tastes, that she had a maniacal abhorrence of the mystic or what pretended to be mystic. As for magicians, she often vowed that they ought to have been exterminated with the mastodons and their ilk.

Magician Flusters Party Hostess

Mr. Train told me all this in advance. To be sure I was not in for a charming time, exactly. However, I did not feel phased. I'm going to tell this one just to show that the embarrassing moments aren't all on the magic maker.

At this party were a number of celebrities. Privately I warned them not to partake of the chocolate-coated mints which would be passed around after dinner.

I happened to be sitting at the hostess' right hand. I managed to take one of the mints and, unseen, slid a half dollar into it.

After dinner things grew a little informal and our hostess directed that the chocolate mints be passed. I picked one up, nibbled at it, and then grunted. I pretended to be terribly ashamed of having made a noise.

Finds Half Dollars in Candy

Fully conscious that my hostess was staring at me in my predicament, I revealed that I had bitten into a half-dollar that had been inserted into the candy.

The rest of the guests were divided between glares and guffaws.

The hostess seemed very much disturbed. While she apologized, I assured her it was perfectly all right, and took another one. This one also turned out to be loaded with a half dollar.

By the time I was through I had a stack of half dollars piled up alongside

In this packing case, Houdini has been shackled and locked. When lowered into the river he escapes from his apparently inescapable prison. Imagine his embarrassment if something went wrong. That gives idea of risks taken by magicians in the performance of spectacular tricks.

of me, which I had extracted from her candy, and she had the most purplish face I have ever seen.

Finally Mr. Train let the cat out of the bag. She was indeed quite good-natured about it all. Today I do not think there is a more enthusiastic lover of magic than my once-embarrassed hostess.

Crucial Moments at First Nights

One of the most unfortunate escapades I have ever undergone so far as discomfitures go occurred on the opening night of the "9:15 Revue".

Everyone knows that the opening night, though this happened to be out in the sticks, marks the thin gray line between fame and failure for a show on Broadway.

This premiere was considered very important for a thousand and one reasons, but principally because New York theatrical brokers were on hand to look the show over with a prospect toward buying up blocks of seats when it landed in New York City.

(Continued on page 188)

Easy Parking With SIDE-STEERING *Car*

Designed by a Pontiac, Mich., mechanic to solve the parking problem, this rebuilt Ford has four steerable wheels, each powered from engine, permitting the car to be moved at an angle of sixty-five degrees and turned in its own length.

FORDS have been forced to do strange things in the past, but the honors for odd performances to date go to a machine, built by a Pontiac, Mich., mechanic, which can move sideways at an angle of 65 degrees, and thus make parking an extremely simple matter.

As demonstrated in the photo above, the machine has each of its wheels mounted on a steering hub, so that a turn of the steering mechanism operates all four wheels.

Electric "De-skeeterization"

IN THE future you may be able to "de-skeeterize" your home by an electrical gadget. This feat becomes possible since an experiment conducted recently in which an electrical hum was produced which lured thousands of male mosquitoes to a premature death.

This electrical hum has the same sound as the mating call of the female mosquito.

Paris Introduces Mechanical Street Sweeper With Disc-Shaped Brushes

Not baby carriages, but new machine recently introduced to sweep Paris streets. Rotating brush may be seen on bottom.

THE workmen in the photo at the left may look like they are pushing glorified baby carriages, but the fact of the matter is that they are busy at the task of cleaning Paris streets with a new sweeping machine recently introduced.

A rotating brush on the bottom of the machine sweeps all debris into a holder above.

Electric Eye Tests Platinum Hair

THAT Jean Harlow, the movie star, really has the platinum blonde hair for which she is famous, is vouched for by electrical engineers. To determine this engineers made a test of her hair with the never-erring electric eye, which is far more sensitive to color than the human eye. The meter registered the same when a genuine piece of platinum was placed in comparison with Miss Harlow's hair, thus establishing her "platinuminity" once and for all.

Parking Machine Lodges 48 Cars on 16 by 24 Foot Lot

This unusual looking building stores 48 cars in the same ground space usually occupied by a two-car garage.

HERE'S good news for car drivers in cities where the search for parking places is an endless task. This novel parking machine appeared recently in the Chicago loop district and will undoubtedly be erected in other large cities soon.

Occupying only a 16 by 24 foot lot (a space about equal to that taken for an ordinary two-car garage), this machine, shown at the left, is capable of storing forty-eight cars. The structure is an endless chain of platforms, any one of which can be brought to the ground for loading.

This new type "garage" stands 105 feet in height, weighs 66 tons, and is operated automatically. Very little time is needed to park or get your car.

Protect Bumper Finish From Oil

MOTORISTS living in cities where the streets are oiled find it impossible to keep this gummy residue from spattering on their cars and ruining the finish. A partial protection for the bumpers can be had by slipping about an 18-inch piece of an inner tube over the bumpers, as illustrated here. This protects the nickel finish and saves time and energy when washing the car.

Oil thrown up by the wheel hits the inner tube section on the bumper which covers nickel.

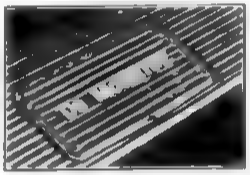
Announcers Now Use Cotton Paper

RADIO announcers are now reading their squibs from crackle-proof cotton paper because it was found that the ordinary rustling of paper made from wood pulp or rags was picked up by the sensitive "mike," greatly magnified, and then transmitted over the air to the listeners like the booming of a drum.

The new paper is made from cotton sheeting of loose, plain weave. It is absolutely rustle-proof and takes typewriting or ink without blurring. All forms of printing, and engraving may be put on the paper.

Car Owner's Name on Foot Plate

WITH so many cars on the street just like the one you drive, it is convenient to have some little individuality on yours to make it easily identified from the rest. One way to do this without altering or detracting from the car's beauty is to use a little foot plate with your name on it. The plate is made of white rubber and is easily installed on the running board, as shown in the photo. This forms an attractive, inexpensive accessory that makes identification simple.

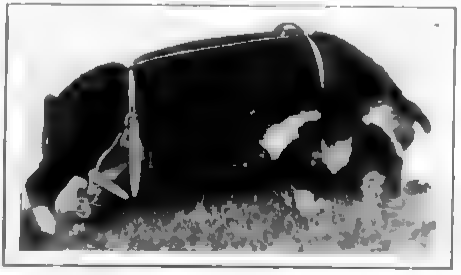


Identify your car at a glance by having your name on the running board in small letters.

Doctor Makes Peg Leg for Porker

WHEN Oscar broke his hind leg some time ago it looked like it wouldn't be long before some white-aproned butcher would be weighing him up as ham, bacon, pigs' feet, etc. However, a doctor was called in and he decided that an operation was in order.

Oscar was given chloroform and slept while the doctor ampulated his limb. Later a peg leg was adjusted on Oscar as the photo shows. The butcher will have to wait.



The peg leg is held in place by a strap harness and Oscar bobbles along with comparative ease as shown above.

Radio Music From Scarecrow Drives Away Bird Invaders

RADIO crooners are good for something anyway. A Texas farmer uses them to scare predatory crows from his cornfield.

The crows are somewhat bewildered, but if they were mechanically inclined they would investigate and learn that the crooning was coming from a loud speaker concealed in the body of a scarecrow, as illustrated in the accompanying photo.

This speaker is wired to the farmer's radio broadcast receiver located in the house, where the tuning for the programs is done. The connecting wires are strung on diminutive telephone poles as shown, so that there is no danger of short circuit in wet weather.

The stunt can be worked by anyone employing only an ordinary radio set and low priced speaker.

Loud speaker will frighten crows away when placed in the scarecrow as illustrated in the photo above. Wires leading to the radio broadcast receiver are strung up on poles to prevent short circuits in wet weather.

High Speed Makes Autos Deadly

AUTOMOBILE accidents are increasing, insurance statistics show, both in number and in seriousness. This increase cannot be blamed, however, on greater faults of the machines, for more than 95 per cent of the cars involved in accidents in 1931 were found to be in good condition.

The real trouble is human mistakes, made irreparable by higher speeds. What can be done to prevent these accidents is to reduce the high and ever increasing average speed of automobiles on streets and highways, which is what converts so many mistakes into fatal tragedies.

Chemical Powder Freezes Fires

A NEW type of fire fighting device, recently introduced in Germany, extinguishes fires by freezing them with chemicals. Instead of shooting a stream of water, in combating the blazes, the apparatus projects a stream of fine powder, which is of such a chemical nature that it freezes when it comes into contact with heat. With this scheme, damage by water is eliminated. The tanks are carried on the rear of the fire engine, as the photo below shows.

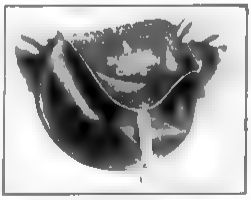
Fine powder carried in tanks is sprayed on the fire, where it freezes to extinguish the blazes, eliminating water damage.

Why Ancients Drilled Skulls

A THEORY for the cause of trepanning, or opening a person's head, was recently advanced by scientists. The ancients believed that epilepsy was caused by an evil spirit imprisoned inside the victim's skull and the opening in the skull released the demon. In many cases the victim was actually cured.

Bathing Cap Has Suction Cups

A WATERPROOF bathing cap now on the market is provided with a one-inch band, consisting of three rows of scientifically designed suction cups, which permits the cap to fit over the head perfectly so as to exclude all water. The wearer merely moistens the suction cups, tucks the hair up inside past the cup band, and thereby becomes prepared for a comfortable swim.



Suction cups lining edge of bathing cap keep water from hair.

Making Trick PICTURES

Fig. 1. To photograph Junior while he sails back and forth in his swing, arrange two outriggers, one to support the camera, the other to support the counterbalance weight, as shown. The weight is, of course, hidden by the subject in the swing.

Fig. 2. Photographing a person walking along the street is accomplished by mounting the camera on a rubber-tired coaster wagon.

A home movie camera in action. Your pictures will provide far greater amusement if you get "shots" which have human interest and unique photographic angles.

by

Walter E. Burton

Half the fun in making home movies lies in getting unusual shots that will mystify friends viewing your production. Taking such trick pictures is quite simple and easy, as told here.

IF YOU purchase, borrow, or receive as a present a motion picture camera, you will find the mere process of photographing everything in sight thrilling enough for the first half-dozen reels. Then you will look about for new fields to conquer. Perhaps you will undertake the making of your own dramas or comedies—movies with a plot or at least a basic theme.

Whether you set out to tell a story in pictures, or merely are trying to make short scenes that will cause your friends to say "How in the world did he do that?" you will find the production of "trick" movies an absorbing pastime, and not necessarily a costly one.

Fantastic Scenes Easy to Fake

You are, for example, making a picture in which a tired business man relaxes a bit and sees the vision of a fairy—or maybe a certain chorus girl—dancing lightly on the desk before him. The photographing of the man sitting before his desk and of a girl of miniature proportions dancing on the desk top at the same time may seem an extremely difficult task. In reality it is extremely simple, once you know the trick. This is how it can be done:

Miniature Chorus Girl Dances on Desk

Arrange the man and his desk in front of a photographically black background, as illustrated in Fig. 3. A piece of dead black cloth or other material will do, if it does not exhibit highlights. Plush, for example, is unsuitable because its glossy texture reflects some light.

One of the easiest arrangements is to place the man and desk at some distance in front of a large open doorway leading into a dark room.

Now place the fairy or chorus-girl dancer on a black platform the same height as the

with a Home Movie Camera

Fig. 3. The tiny chorus girl or fairy appears to be dancing on the desk when the shot is made as illustrated here. Dance table is set at distance, with dancer against black background, while camera lens is lowered to height of the desk top. Insert shows the resulting picture obtained.

Fig. 4. Water is sprinkled before camera lens for rain shot as shown.

desk, and several feet behind it. Set the camera with its lens at the desk and platform level, and focus so that both the near-by desk and man and the distant dancer are sharply defined.

Now according to the laws of perspective the dancer will be rendered in small size, compared to the man; and she will appear to be dancing on the desk top. Few spectators will notice that most of the background is black.

Producing Sand and Rainstorm Scenes

The producing of rain and sandstorm pictures may appear difficult enough to be beyond the amateur cameraman's resources. But this is not necessarily the case.

Consider the rainstorm first. If you place your camera at a fairly high elevation so that the area being photographed is not great, and squirt water with a hose so that it falls in drops just ahead of the camera lens, and directly on at least part of the scene as shown in Fig. 4, you will obtain a realistic storm effect. Of course, you must wet the players and surrounding objects beforehand. An electric fan or two will produce enough wind to give the effect of rain being driven before a gale.

Don't make the fatal mistake of photographing a rain scene in bright sunlight. Choose a cloudy day.

Electric Fan Blows Sandstorm

The production of a sandstorm is similar in method, except that sand is used instead of water, and is driven by an electric fan placed near the camera, and out of the lens field (see Fig. 10). You can throw dry sand in front of the fan with a small shovel, or

Fig. 5. Two brackets bolted together and secured to the tripod as shown above make upside-down mounting for taking reverse-action pictures. Upper bracket holds the camera.

let it run through a large funnel into the blast.

The terrain being photographed must be sandy, and the actors sand-spattered. In producing both rain and sandstorm pictures, you may not be entirely successful the first time, but practice will make for perfection.

How to "Shoot" Moving Subjects

In the theatre you have probably observed time and again the effect of following actors who are driving a car, riding a bicycle, flying a plane, walking or moving by some other means. How were these pictures obtained?

The shooting of such scenes is easy with simple equipment. For instance, if you desire to photograph Junior while he is sailing back and forth in his swing, you need only arrange a strong outrigger to support the camera in front of the swing,

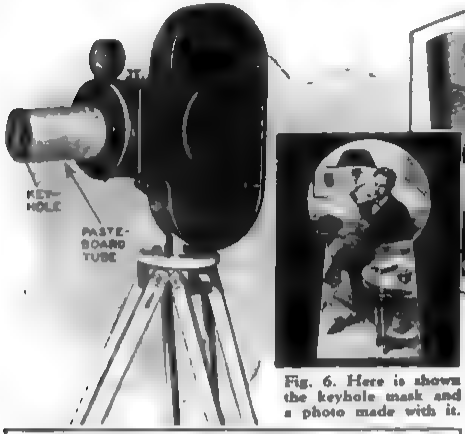


Fig. 6. Here is shown the keyhole mask and a photo made with it.

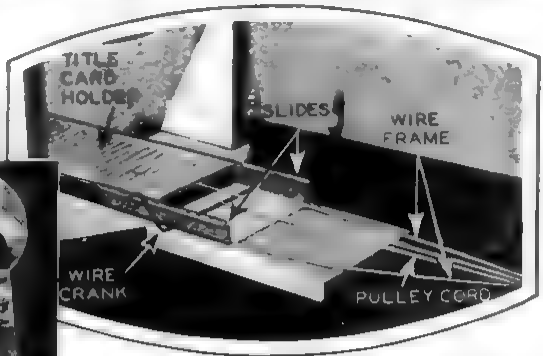


Fig. 7. In this simple contrivance for photographing titles, the card is placed on a metal sheet which slides in a groove in the frame. Supports of heavy wire projecting beyond each end of the frame have pulleys through which a strong linen cord runs. This cord is looped around the crank.

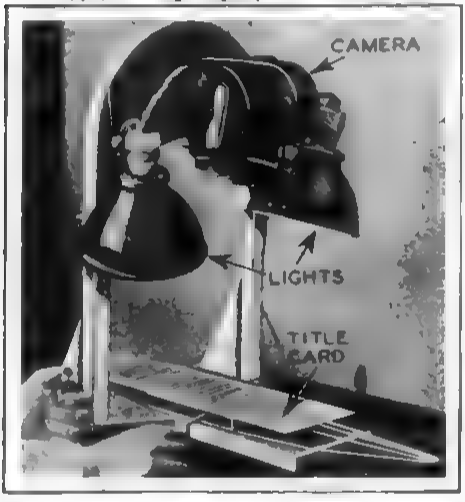


Fig. 8. Card on which titles are lettered is moved by turning the crank, causing the cord to pull the metal plate along under the camera lens. Lights and camera are mounted in the position shown. Move card at rate which you can read.

and a similar projection at the rear for a counterbalancing weight, as illustrated in Fig. 1.

Fasten the camera securely, lock the button at the "on" position, and start the swing. The resulting film will show Junior at all times in focus, but obviously swinging because the background is in apparent motion.

Auto Shots Made From Platform

This method can be extended to include an endless number of applications. With a camera platform attached to the front of an automobile as shown in Fig. 9, good motoring shots can be made. It is advisable to remove or let down the wind shield when possible.

For following or preceding walking actors, a small truck, called a "dolly" in studios, is necessary. A child's coaster wagon, preferably one with rubber tires, is elaborate enough for amateur purposes. Fig. 2 illustrates how this stunt is worked.

Anyone who has attempted to develop a glass negative in warm weather, and seen his hopes slip away with the overheated emulsion, will know instinctively how to make a "dissolving" picture.

Making Dissolving Pictures

On the screen the spectators see a face or other object that gradually melts into a confusing mass. The effect is highly amusing, and is obtained by arranging a positive transparency of the picture so that it will melt and slide off its support while it is being copied with a movie camera.

Glass photographic plates are superior to film for the positive, because the emulsion on them is easily affected by heat.

Arrange the glass-plate positive so that it is suspended in a glass-sided vessel into which warm water can be introduced steadily, or which can be heated over a flame. (See Fig. 11.) Focus the camera on this positive, and arrange back illumination so that the light is evenly distributed.

Device for Making Moving Titles

Take a few feet of the picture before it starts to melt. Then increase the temperature of the water until the effect is complete. A little experimenting with old negatives will teach you the trick.

There are dozens of ways to make moving titles—those which are too long to be included in a single frame on the film. To devise a moving title board that is mechanically simple, first have a tinsmith make a sheet metal holder for the printed title, and a frame in which it can be moved lengthwise, as illustrated in Figs. 7 and 8. Supports of heavy wire projecting beyond each end of the frame have pulleys through which a strong linen cord runs. This cord is looped several times around a heavy wire crank set into the frame, and the ends are

Sand Poured in Front of Fan Makes Fake Sand Storm for Desert Scenes

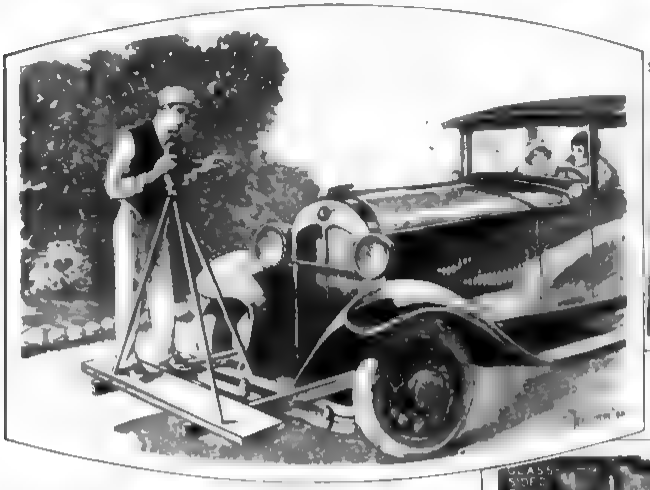


Fig. 9. Good motoring shots can be made by attaching a platform to the front of the automobile as shown in above drawing. It is advisable to let down windshield for best shots

Fig. 10. Sandstorm is simulated by pouring sand through funnel, so that it falls in the blast of the electric fan, to be blown across scene.

attached to the opposite ends of the title-card holder.

Thus, by turning the crank, the operator moves the card past the camera lens as rapidly as desired. A good way to judge the speed is to read the title as you operate the crank.

Whenever possible, use a tripod for supporting your camera while making moving pictures. You will be rewarded by scenes that do not make spectators seasick to view them. But you cannot always carry a tripod with you. The best substitute is a good supply of ingenuity.

Tripods Easily Improvised

A 3-in. piece of threaded rod that will screw into the tripod socket, and a washer and wing nut to fit, will be found useful for attaching the camera to various objects. Some of the clamping devices on the market can be used, but care should be exercised because of the considerable weight of the average movie camera.

If you make pictures from an automobile frequently, you will be repaid by installing a permanent mounting somewhere. A small iron bracket on the dash, where the camera can be aimed through the windshield or door, is one possibility.

Keyhole pictures sometimes lend a bit of humor to a reel. All you need to make such a scene—one that looks as if it had been photographed through a keyhole—is a piece of black paper and a means of fastening a small disc of it in front of the camera lens.

Unique Pictures With Keyhole Mask

Cut out an opening the shape of a keyhole, in the center of the paper disc. Then place the disc, with the keyhole in normal position, in front of the lens. The larger the hole, the farther from the lens you must

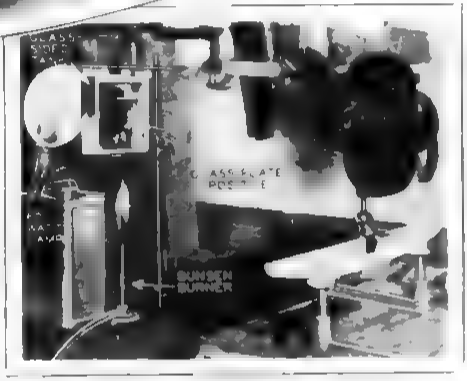


Fig. 11. To make dissolving pictures, arrange glass plate positive so that it is suspended in glass-sided vessel filled with water. Heating the water with a burner causes the emulsion to dissolve, permitting an unique shot with camera.

place it. Another method is illustrated in Fig. 6.

In making the exposure, give a little more time than the lens stop indicates. In photographing keyhole scenes, as well as other types where "freak" effects are desired, be logical. That is, do not shoot a landscape scene through a keyhole mask. Make it a burglar at work, someone stealing up the porch steps, or something similar.

How to Make Objects Disappear

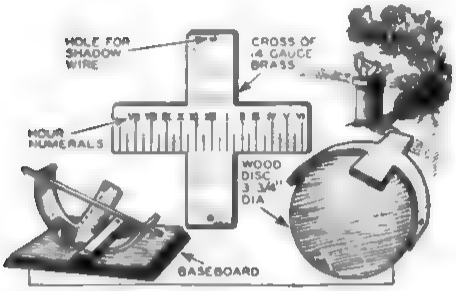
The ability of the motion picture camera to stop while some detail of the scene or action is changed opens the way for performing all kinds of magic tricks on the screen. A man sits at the table, reads his menu and speaks to the waiter. Instantly the grapefruit appears before him, followed by the other dishes in rapid succession.

This effect is obtained by having the diner and the waiter hold their poses rigidly while the camera is stopped and the grapefruit set down. Then a foot or two

(Continued on page 185)

HANDIKINKS

When you've got a tedious, difficult job on hand consult Handikinks department for a method to do the work in a simple and easy manner. Workshop fans, campers, handymen, housewives, etc., are sure to find stunts of great convenience in these pages.

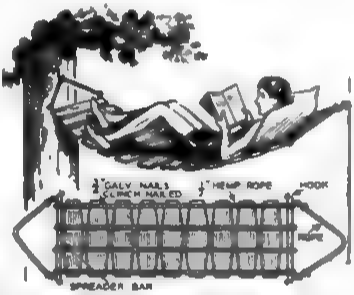


Decorate Lawn With This Sun Dial

HERE'S something new in sun dials. To make it, cut out a cross of 14-gauge brass and mark off with a cold chisel on one of the members twelve lines as shown in the accompanying photo. Stamp the Roman numerals also with a cold chisel. Next, cut a disc of wood 3¾ in. in diameter and bend the scale arm around it to form a semicircle. Then pound the other two arms into the same shape and attach the shadow wire. Set up the dial with the shadow wire slanting toward the North Star.—Clair L. Wade.

Barrel Staves Make Comfortable Hammock

MAKING a comfortable hammock is a simple task if you can lay hands on some rope and old barrel staves. Arrange the staves in a row, as illustrated in the accompanying drawing, and secure them to the half-inch hemp rope with clinch nails. Fasten the ends of the ropes to a spreader bar, then suspend the hammock by means of ropes attached to the ends of these spreader bars. The result is a cheap, sturdy, serviceable hammock which holds no danger of injuring the occupant.—Wallace MacVey.



Rain Plays Tin Can Xylophone

IT'S a pleasant sensation to hear the rain pattering on a tin roof while lying in bed in the morning, and this simple program can be expanded by building a simple xylophone of tin cans and placing them under the dripping eaves, as illustrated in the accompanying drawing. One end should be removed from the cans, which should be graduated from large to small diameters and nailed upside down in notches in a board, as shown. When the rain drops strike the cans musical sounds will ring out, and you'll be amazed at the strange tunes the water will play.
—Hi Sibley.

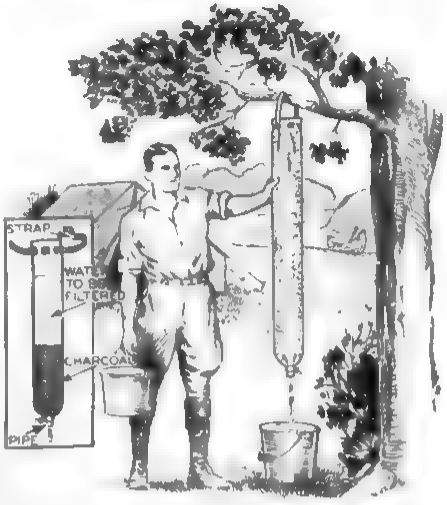
Vegetable Cooler for Grocery Store

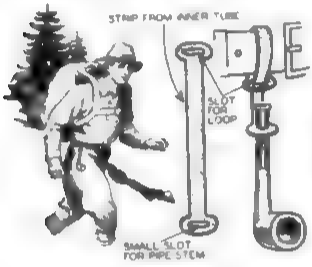
GROCERS who keep vegetables on display suffer great waste because of the wilting of the goods in the sunlight of the display window. To overcome this difficulty, rig up a zinc tray with a drain as illustrated in the accompanying drawing. A fine spray made by soldering the plugged nozzle of a gas jet to a pipe leading from the water mains, will suffice to keep the vegetables moistened. The needle stream is deflected downwards over the vegetables by means of funnel-shaped spray hood, as illustrated. Vegetables are spread out on a wooden grating, permitting the water to drain off easily. Evaporation keeps vegetables cool, eliminating spoilage.—Don Ellis.

Kinks Remove Camping Discomforts

Simple Water Filter for Campers

WHEN you're on an auto-camping expedition the water situation sometimes gets pretty serious, but if you employ this little scheme your troubles will be over. What you need chiefly is a length of inner tube about five feet long. In the end of this is slipped a half-inch piece of pipe or glass tubing, which is held with cord or wire binding. The next task is to build a wood fire to make a small quantity of charcoal. Break the charcoal in pieces from the size of a pea to the size of a walnut, and fill the tube half full with this material. Even muddy ditch water poured into this filter will come out drinkable.—A. H. Waychoff.



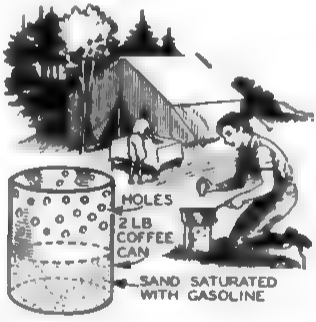


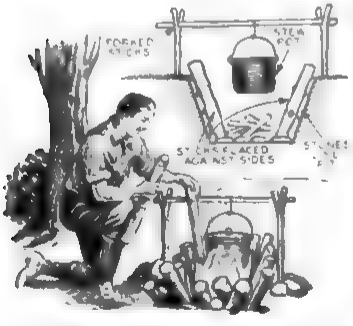
Hiker's Pipe Carrier

HERE is about the handiest thing yet in the way of pipe holders for hikers who like to smoke en route. All you need is a small strip from an inner tube, which should be cut approximately to the shape shown in the accompanying drawing. When looped as illustrated the holder can be suspended from the belt.—Dave Weiman.

Gasoline-Soaked Sand Makes Camp Stove

THOUGH this little camp stove is simplicity itself, it is none-the-less adequate at the task of cooking your dinner. A coffee can, a small quantity of sand and some gasoline do the job. Punch holes in the can, as shown, and fill it half full of sand. Then pour in gasoline till the sand is saturated, and you will have as good a gas burner as you could want.—Wilbur Mannheim.



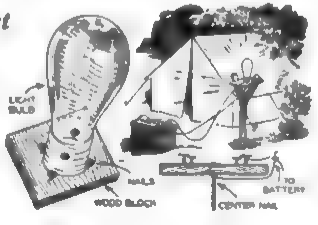


Slow-Burning Fire Fed Automatically

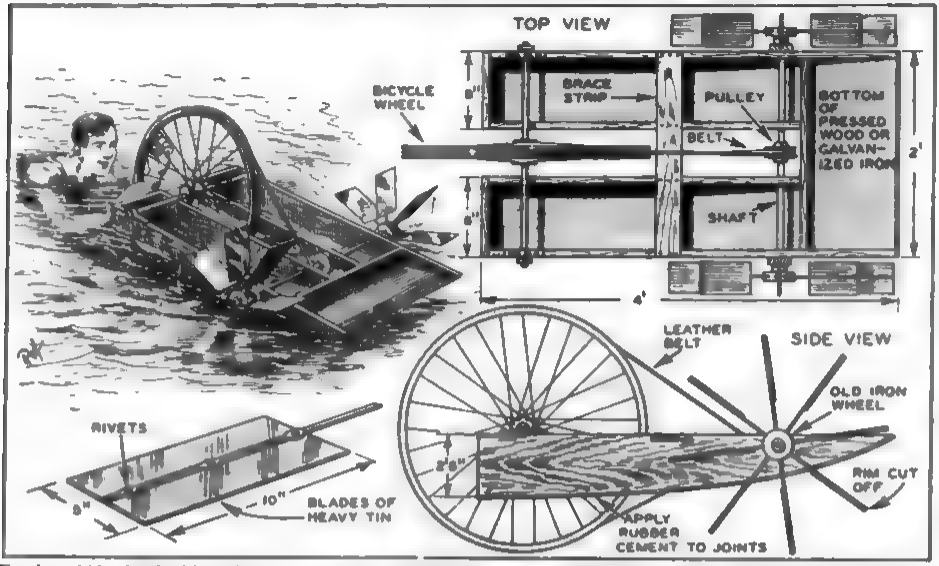
TO CONSTRUCT a camp stove that will automatically feed a slow fire, so that it will be suitable for cooking stew or soup, first of all dig out a hole in the ground twice the depth and twice the diameter of the pot to be used, then line with stones. On the floor build a small fire so that the flames come within a couple of inches of the surface of the ground. When the fire is burning, place a number of sticks around the edge.—M. Barthomew.

Tacks in Board Make Emergency Light Socket

WHEN you are in need of a camp light or a trouble light, rig up this simple little socket and you will have all the illumination you want. The socket consists of five shingle nails driven into a piece of wood, four around the edge to form a square just large enough to hold the bulb, and the fifth in the center. Hook the outer nails together, running a wire to the battery, then wire the center nail to the other battery terminal. Set the bulb in the socket as illustrated.—Thomas Holtzman.



Paddle Wheel Boat for Swimmers



Turning of bicycle wheel by swimmer operates the paddles, as shown above. Add ballast if front tends to rise out of water.

INSTEAD of riding in this unique water craft, you don your bathing suit and trail along behind in the water. By merely pulling on the bicycle wheel (without tire) you are propelled along at a merry clip.

The boat need not be large. Cut out four side pieces shaped like sled runners from a board 8 inches wide. See that the taper is gradual from stem to stern. Sandpaper the sawed edges smooth.

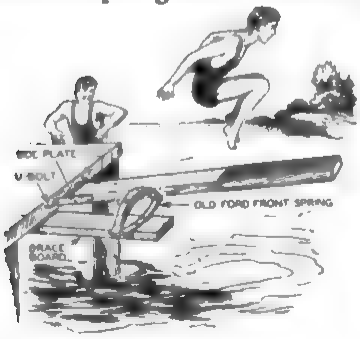
Get a piece of galvanized iron large enough to fit the bottom. Apply a liberal coating of rubber cement to the two outside runners and then nail the bottom in place with shingle nails spaced 1 inch apart.

Nail another 8-inch wide board across the back, applying rubber cement to the joints. Now set the two runners in place and mark the fronts 10 inches from the tips. Remove and saw off square. Then set them in place again and nail in the center of the boat 3 or 4 inches apart, using rubber cement and shingle nails for the bottom.

Get a bicycle wheel and mount it on a shaft long enough to reach across the boat. Run the shaft ends through two small bearings to be mounted on the boat sides. The paddle wheels are made from two iron wheels of 24 or 30 inches in diameter. First cut off the rim with a cold chisel, then flatten the spokes at three points on each and drill for rivets. The blades are cut from heavy tin about 5 inches wide and 10 or 12 inches long.

These two paddle wheels are now mounted on another shaft run through holes in the sides of the boat and also through holes bored in the slot sides and the wheels keyed to the outside ends. This shaft also has a small grooved pulley.—Dale R. Van Horn.

Front Spring From Old Ford Limbers Up Swimmin' Hole Spring Board

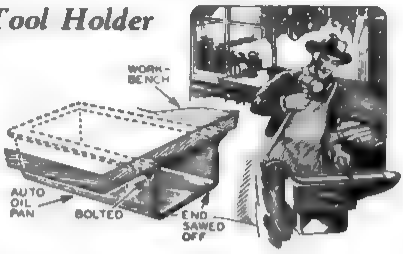


IF YOU'RE dissatisfied with the spring board at the well-known "ole swimmin' hole," you can make some vast improvements upon its springing qualities by employing a front spring from an old decrepit Ford. The board, cut considerably shorter, should be hinged to the platform with a pair of side plates and U-bolts, as illustrated in the accompanying drawing. Then, underneath the platform, attach a sturdy brace board, and on the end of it secure the Ford spring. The spring board rests on this spring, as illustrated, and adds a surprising limberness to the board when you give a few leaps on it. What's better, it will stand up a lot better under the pounces of heavyweights. Of course, to prevent slipping and serious accidents you should pad the end of the board carefully with burlap.—Walter Dorran.

Stunts to Save Labor in Workshop

Auto Pan Makes Handy Under-bench Tool Holder

SHORT sledges, tommy bars, and other heavy tools will always be convenient and in safe keeping if you add this holder to your workbench. It is made simply by sawing one end off an old auto oil pan and bolting it just underneath the front of the work bench, as illustrated in the accompanying drawing. Though pans from four cylinder cars will work fine, the six cylinder pans will hold longer tools. If the pan is deeper at one end, so much the better, for the tools will not slide out.—Thomas Moore.

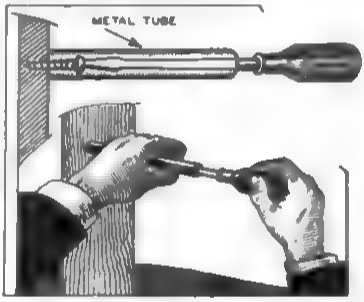


Sandpaper Wound on Cylinder Makes Lathe Sander

IF YOU are working along without a motor sander in your shop, but have a lathe, rig up this sanding attachment and you will be able to turn out good work quickly. Cut out a cylinder of wood 2½ in. in diameter and about 10 in. long, then wrap a sheet of sandpaper (any grade you may want) around it until the wood is completely covered. Tack the ends of the sandpaper down all around, but do not tack in the middle. To use this attachment, just put it in the lathe, and raise the tool rest till it is even with the top edge of the sandpaper roll. Then run the work across the roll as you would a regular sander.—Walter Yeary.

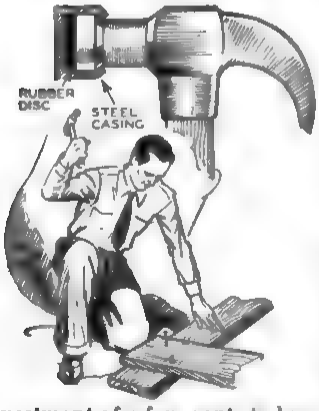
Metal Tube Helps to Drive Screws Straight

USUALLY when driving screws that are hard to reach, you have a hard time trying to keep the screwdriver point in the slot, and so have difficulty in getting the screw in straight. A good idea in this situation is to place a suitable sized piece of metal tubing or pipe over the screw, and slide the screwdriver in until it rests in the slot. This will keep the screwdriver steadily in place.—Altamont Cole.



Silencer for Hammer

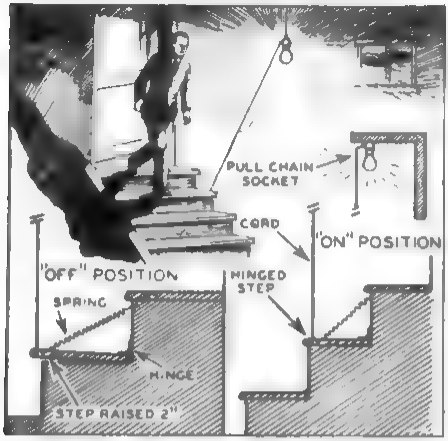
WORKSHOP fans who are afflicted with neighbors and families who object to the banging of a hammer will welcome a silencer such as this. You can make it simply by cutting out a piece of steel on the lathe as shown in the accompanying drawing, leaving lugs on the top which can be turned over to hold the device securely on the hammer. Let the depth be right to receive a solid disc of rubber which serves as the silencer. John E. Hyler.



Half Rubber Ball Keeps Shavings Out of Eyes

IT IS no pleasure to attempt to drill a hole vertically in the ceiling directly overhead. Sawdust, dirt and shavings fall into the face and eyes. The investment of a few cents to buy a rubber ball about four inches in diameter will provide a retainer which will catch this debris. Cut it in two pieces at the seam. Invert one half so that it looks like a cup. A small hole may be cut in the exact bottom of this cup, and then it can be pulled over the bit up to the jaws of the drill handle. This cup catches all of the litter and the workman can keep at his task without receiving an avalanche of shavings.—W. H. Leach.

Simple Aids to Home Convenience

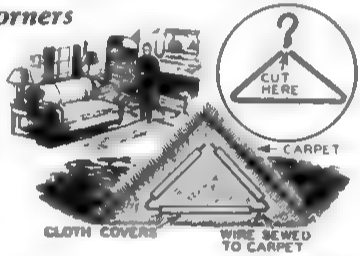


Footsteps Turn On, Off Cellar Light

IF YOU happen to be one of those people who, after leaving the basement, forget to switch off the light at night, try this novel idea. Parts required are several feet of stout cord and a discarded screen door spring. The switch should be of the chain pull socket variety, fastened on wall or near as possible to stairway. The spring is fastened to top of steps under the socket, as shown in illustration. The cord is fastened to chain pull and down to bottom step on which spring is fastened. The step is movable by hinges at back. In normal position the step is raised an inch or two by the spring. When entering basement, your weight on step pulls chain and the light is on. On coming up, weight turns light off. Several adjustments may have to be made with spring tension and length of cord before proper action is secured from switch.—Truman I. Greenwalt.

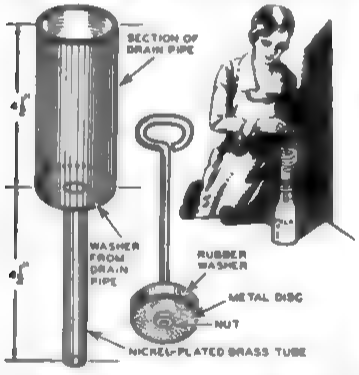
Clothes Hangers Prevent Curling Carpet Corners

CARPETS have an exasperating habit of curling at the corners. In this condition they are unsightly and persons are continually tripping over them. A simple remedy is illustrated in the accompanying drawing. Cut four wire clothes hangers just below the hooks and sew them to the underside of carpet at each corner. Sew strips of heavy cloth over the wire. — Thomas Moore.



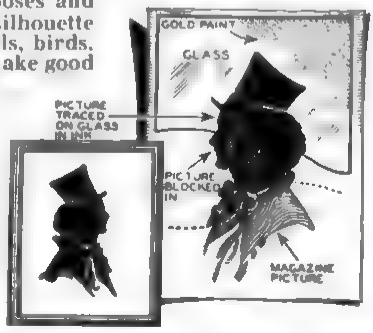
Simple Pump Removes Cream From Bottles

HOUSEWIVES know what a difficult job they have in removing the cream from a bottle of milk. With this simple suction pump, however, the job is easy. Onto a section of nickel-plated drain pipe, solder a washer from the same source, and also a smaller nickel-plated brass tube, as illustrated in the drawing. The plunger is simply a brass rod, threaded on the end to hold the washer, which should be cut from gasket rubber. In operation, the thumb of the left hand is held partially over the end of the barrel to keep the plunger from coming out. The tube is inserted to the depth of the cream.—Oscar Wells.



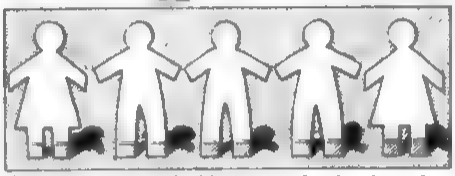
Making Attractive Black and Gold Silhouettes From Magazine Pictures

SILHOUETTES are used for many decorative purposes and are the simplest form of picture. The pattern for silhouette shown here is made from magazine pictures. Animals, birds, landscapes, human figures, profiles of heads, etc., all make good subjects. The picture is blocked in with black ink covering all features and details, leaving only the outline, which is carefully preserved. When this blocking-in is finished, a glass is placed over the picture and the silhouette is carefully traced on the glass in India ink with a coarse pen. Care must be used not to move the glass while this work is being done. A small brush is then used to fill in the outline drawn with the pen. When the ink has thoroughly dried, the whole back of the glass is painted with gold paint or lacquer. All of the work is done on the back of the glass. When the gold paint is dry the silhouette is ready to be framed and hung up.—Harold Jackson.



Magnetic Dancers Mystify Onlookers

Magnetic dancers hop and skip around amusingly when the celluloid top of the box is massaged with a cloth, as shown.

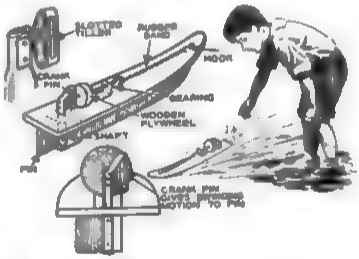


Figures are cut out of stiff paper to the size shown here.

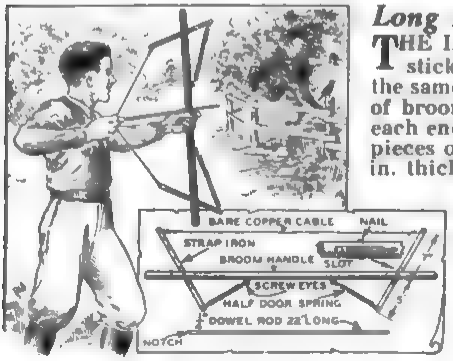
HERE'S a way to mystify your friends who are not on to the strange habits that electricity has at times. The "magnetic dancers," as the little figures shown in the accompanying drawing might be called, hop and skip about as if they were alive. To work out the trick procure, first, an old shallow cigar box and cover the top with a thick sheet of celluloid. Then cut out the little figures shown at the right, weighting their feet with pieces of thin wood cut from a match box. This much done, now place the figures in the box and nail on the top. When the celluloid is rubbed with a cloth, the figures will hop and skip around in the most surprising and amusing manner.—Florence Kosky.

Toy Boat Propelled by Sculling Motion

AN ENTIRELY new method of propulsion, called "sculling," is employed in the operation of the little boat shown at the right. The side-swiping motion of the fin sends the ship along at a rapid gait. What operates this fin is a slotted tiller, which is manipulated by a flywheel turning on a shaft, as illustrated. The end of this shaft is bent to form a hook, and to this hook is fastened a rubber band. To wind up the motor, rotate the flywheel until the rubber has been twisted tightly.—Bill Kelsie.



Long Range Bow Has Springs for Tension



THE Indians may never have heard of this broomstick bow, but it makes an effective weapon just the same. The backbone of the bow consists of a piece of broomstick handle 30 in. long, with a slot cut in each end 2 in. in length and ¼ in. wide. Next cut two pieces of strap iron 12 in. long, ½ in. wide, and 3-32 in. thick. Drill holes in these ½ in. from each end, and also two more 5 in. from the end. Fit the whole thing together as illustrated in the accompanying drawing. What furnishes the tension for the string is a pair of screen door hinges attached with screweyes in the manner shown. The string can be made from copper cable, which stands a lot of punishment when you are on the warpath.—Dale R. Van Horn.

Polo As a Hobby Now Taught on Wooden Hobby Horses

A fair British polo enthusiast is shown learning the proper stroke from atop a safe and sane wooden hobby horse.

THE Equestrian Club of Richmond, England, has recently had erected on its grounds several wooden hobby horses, where women learning to play polo may become acquainted with the art of handling a mallet without the fear of injury that is usually present when the tyro attempts to master the strokes from the back of a real horse.

The hobby horses have been erected in large pits. When one of the fair members succeeds in hitting the ball, which really does happen at times, an attendant places another ball within more or less easy reach of the student and retrieves the ball that has been stroked.

Traffic Controlled in Advance

AUTOMOBILES moving up, down, and across Broad Street in Philadelphia now have their destinies determined a week in advance by a program clock in the City Hall.

The system is designed to sense the traffic requirements of the city and govern itself accordingly. The clock can be set a week in advance to take care of the traffic for each individual day.

Tape Measure Dials Distance

Somewhat resembling a watch, this tape measure shows the distance on dial in feet and inches.

GUNARD BACKSTROM of Chicago has recently obtained patents on a tape measure which, when pulled out, registers the distance measured on a dial.

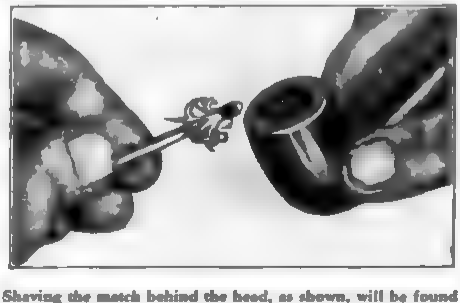
The tape will soon be on the market in three sizes—12 feet, 30 feet, and 100 feet. The dial, which resembles a watch, registers with the small hand in feet and the large hand in inches.

New Fixture Holds Violet Ray Bulb

ULTRA-VIOLET ray baths for the living room, the bed room, the kitchen; in fact, any room, are made possible by the recent invention of a special fixture which holds both the regular light bulb and the ultra-violet ray bulb. A frosted glass shade encloses the regular bulb, while the violet ray bulb is suspended underneath, so that the room is exposed to healthful ray.

Shave the Match on Windy Days

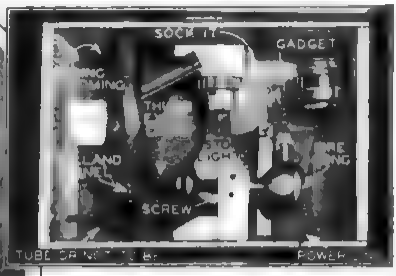
LIGHTING a pipe, or a camp fire on a windy day is simplified when the match stick is shaved as shown. As soon as ignited, the flame from the match head catches the shaved portion on fire and produces a blaze on which a heavy wind has little effect. The shaving is done with any sharp knife, but the cut should not be so deep that the head will break off when match is struck.



Shaving the match behind the head, as shown, will be found to be of assistance in lighting the pipe on a windy day.

Party Fun With This FREAK Camera

It's hard to tell what will happen when you attempt to take a picture with this astounding camera. Anyway the subject in the photo above seems to be prepared for the worst.



Here are the innards of the camera. If strange and incredible pictures do not come out it won't be the fault of the photographer. The contraption is plain foolishness all through, but will liven up a dull party if you produce some previously taken pictures supposedly snapped right there on the spot.

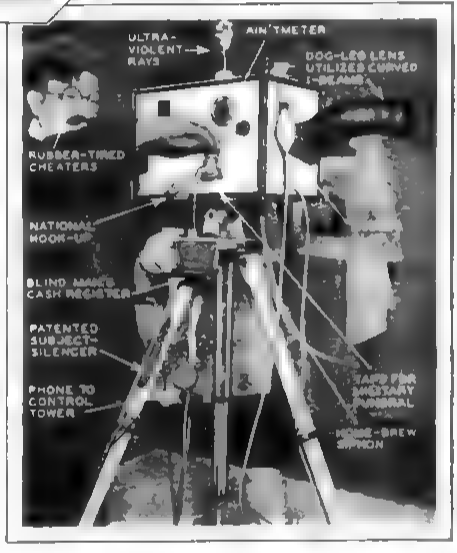
IF YOU are looking for something different in party entertainment, perhaps a freak camera similar to that shown here will help.

This camera started life as a store box. A little paint and a trimming of lantern-slide tape transformed it into something resembling a camera. From that point the construction consisted of attaching accessories that have no connection with photography.

One of these devices is a pair of bells arranged so that coins dropped into slots will ring them one at a time. It was desired to photograph a "hot" subject, so the camera was equipped with an electric cigar-lighter unit mounted inside a small tin can, and covered with a piece of wire screen. Slightly moistened sawdust placed on the screen produced an abundance of smoke.

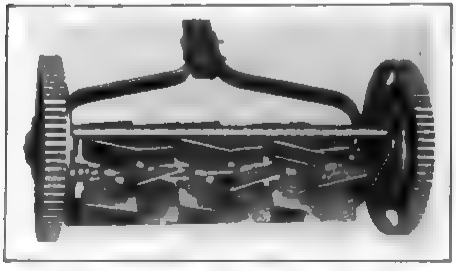
To extinguish the fire, water, retained in a length of garden hose, and drawn from a faucet on the side of the camera, was used.

To produce a crash when the "shutter" was operated, a swinging hammer, operated by a strong coil spring, demolished an old photoflash bulb held in a socket.



When you're photographing a hot subject, it may be necessary to resort to the faucet. In case the picture gets lost in the dog-leg lens, you can apply the ultra-violent rays.

Lawn Mower Has Small Removable Blades Permitting Easy Sharpening



New lawn mower has cutting blades shown in photo above.

THE old style cutting blade of the lawn mower has gone by the board and manufacturers have come out with a new type of clipper which promises to level off the grass with a greater degree of ease.

These new blades, arranged as shown in the accompanying photo, are ranged in an uneven line and extend out from collars on the center shaft. In case a blade becomes dulled it can easily be removed, so that sharpening is made much easier. What makes the blades most serviceable, however, is the fact that they refuse to jam easily.

Glider Pilot Takes to Air on a Bike Equipped With Wings

Hans Richter, glider pilot, preparing for take-off on wing-equipped bicycle. He attained altitude of several feet.

BY ATTACHING a large glider wing to his bicycle, Hans Richter, noted German glider pilot, recently succeeded in raising his flying bicycle a short distance above the ground. The feat was performed at the Templehof Airport, Berlin.

This new type of flying machine is something almost every bike owner can experiment with. As the photo shows, a large glider wing is secured to the bike by two rods; one attached to a special socket just below the handle bars, and the other on the back of the frame. The wing is tilted up to increase the lift.

Motorist Tip for Starting Car

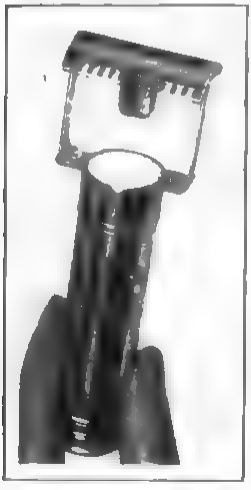
WHEN auto starters jam it is usually caused by having the spark too far advanced. Release is easily affected by putting the car in high gear and rocking it back and forth with the ignition turned off and brakes released.

It is advisable not to attempt to tow the car to start it because this makes it necessary to loosen the starter from the motor to permit the gear to drop back into position. Rocking does the trick in a hurry.

Television Shows Stock Reports

THOSE who "play the markets" are now able to sit in an easy chair at home or in their office and see the stock quotations flashed before them by television. This experiment was successfully tried out in Chicago and the figures were discernible at a distance of 25 feet from the receiving set.

Razor Furnishes Shaver's Light



Combination flashlight and razor assures clean shave by giving adequate light on face.

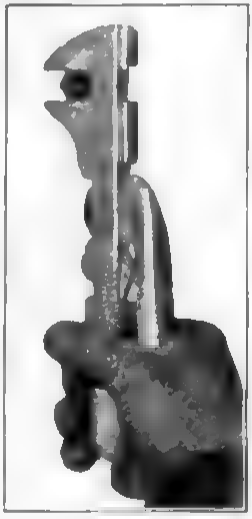
HERE is a razor that shavers everywhere have been asking for. A small battery and electric bulb are contained in the handle of the razor and focus a light right on the spot where the razor is cutting, assuring a clean, thorough shave.

The razor is removable, thus giving you a neat little flash light for emergencies. A convenient feature of the light is that it makes shaving possible in a dimly lighted room. It is easily held in the hand and is not cumbersome to handle.

New Wrench Has Vise-Like Grip

THE most desirable features of pliers and the ordinary monkey wrench are combined in the new "Visegrip" wrench which is shown here. The wrench is adjusted the same as a monkey wrench but has two handles, which, when closed like plier handles, actuate a toggle joint forcing the jaws together like a vise.

The head is electrically welded to the shank, uniting them into one piece. The entire wrench is about eight inches long and is cadmium plated to prevent rusting.



Pressure on handle of this new "Visegrip" tightens the jaws to give firm grip on object.

Nature Building Nicaragua Canal

AN EARTHQUAKE in Nicaragua revealed that a subterranean river flowing from Lake Managua will eventually result in the removal of the hill under which it flows and thus result in a natural canal to the Pacific, more easily passable than the Panama Canal.

PLANE TALK

Edited by DOUGLAS ROLFE

Inexpensive Simple Air Speed Indicator

QUITE recently there has appeared upon some of the many sport planes a simple, inexpensive air speed indicator. It is to be noted that it formed part of the equipment of the plane piloted so spectacularly by Major Udet, the German ace, at the Cleveland air races. Most pilots would have needed all assistance possible to perform the stunts carried out by Udet as, for instance, the loop with a dead engine.

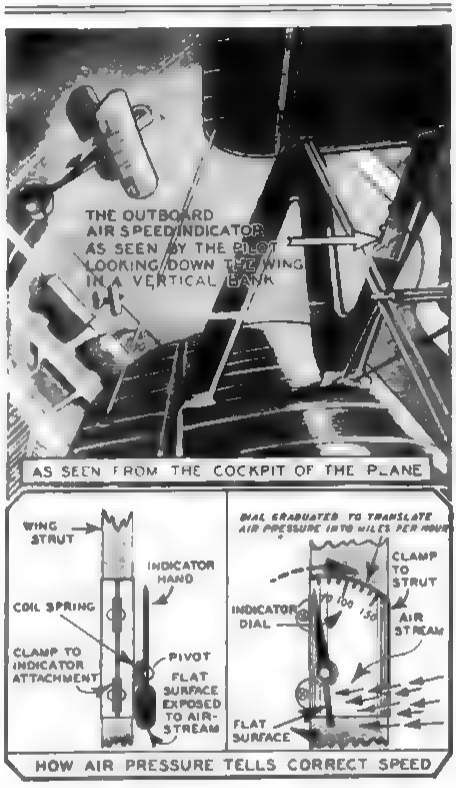
The air speed indicator has very few parts. There are the indicator with one end pointed for showing the air speed and the other end in the form of a flat plate which creates pressure as the air plane gathers speed, and thus moves around an axis.

A steel spring has sufficient tension to limit the movement of the flat plate and the indicator and thus insure that the proper air speed is registered. The indicator is mounted upon one of the struts between the planes or some other member where the air flow is not interrupted by other parts of the plane.

The fitting by which the indicator is attached to the strut has a dial with graduations which give the air speed in miles per hour.

The graduations with their numerals may be sufficiently large so that they can be read from the cockpit. In some cases the different speed ranges are indicated in different colors.

The readings may be varied for different planes by increasing the area of the flat plate, lengthening the distance of the plate from the axis, changing the tension of the spring or using a different indicating scale.



The drawing and diagrams above illustrate the principles of operation of the simple air speed indicator. Air pressure against the flat plate rotates the dial pointer.

Electric Heater for Aviators

AVIATORS' gloves and clothing heated by the electricity from the storage battery of the airplane are among the possibilities of a new flexible, rubber heating unit announced recently.

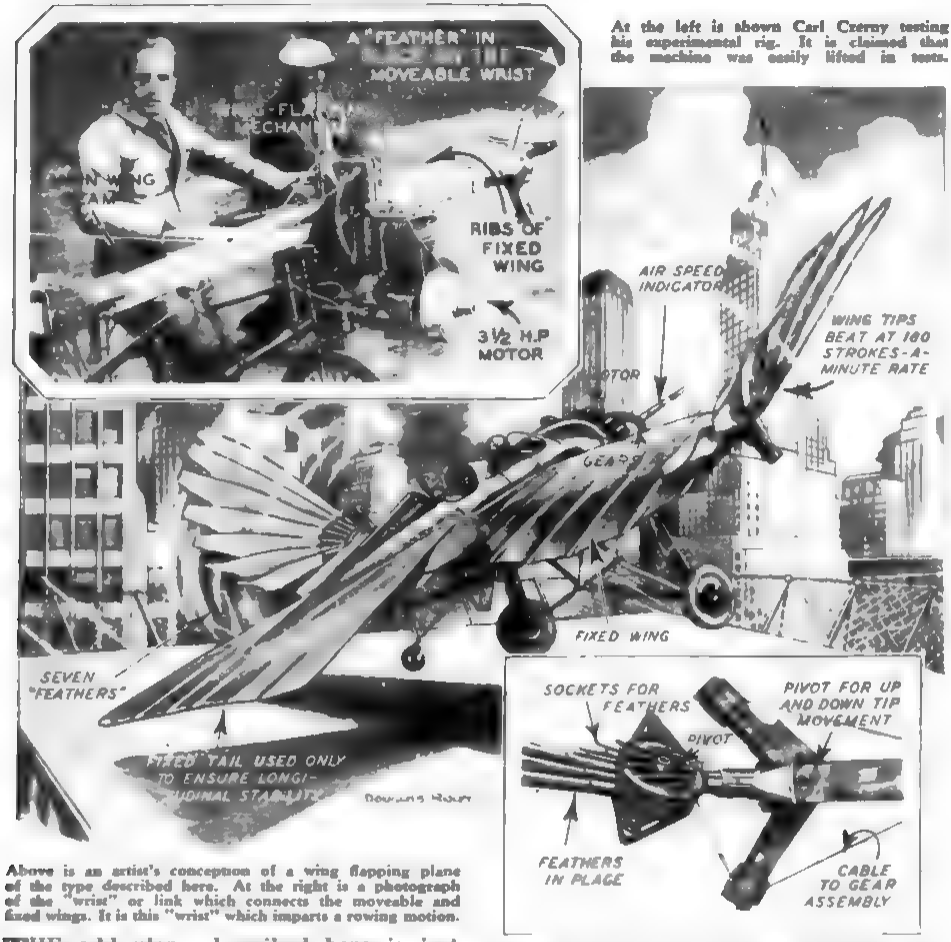
This unit consists of a thin rubber strip about a half inch wide and a foot long, very flexible, and having a heating element vulcanized inside. It is designed to work on the 12 to 14 volts of the airplane storage battery, draws about a third of an ampere in current and thus is rated about 3½ watts.

The flexibility of the unit makes it of particular promise in applications for for warming the gloves and clothing of aviators. In cold weather flights or at very high altitudes where the temperature drops far below zero, electrically heated clothing would be of great value in keeping the aviator warm and able to operate his ship properly.

Some experiments have already been carried out on gloves incorporating the new element by Wright Field. The War Department has purchased about 200 of the units, and the first pair of the new type glove is being tested. The glove is of the thumb and one finger design and is made of light, fine material with a cuff of lamb's wool.

Four heating elements are sewed between the lining and the outer cover of the glove; one over the finger, one over the thumb, and two over the mitten part of the glove.

Why Wing-Flapping PLANES Won't Fly



At the left is shown Carl Czerny testing his experimental rig. It is claimed that the machine was easily lifted in tests.

Above is an artist's conception of a wing flapping plane of the type described here. At the right is a photograph of the "wrist" or link which connects the moveable and fixed wings. It is this "wrist" which imparts a rowing motion.

THE odd plane described here is just another manifestation of the wing-flapping idea which has cropped up periodically ever since man first considered the conquest of the air.

There is a certain brand of inventor obsessed with the idea that the only satisfactory way to achieve flight is by a literal application of bird-flight principles. To this class of inventor all present day aircraft appear completely unsatisfactory particularly in their use of airscrews rather than wing beats as a means of propulsion.

As a matter of fact, if the wing-flapping theory is tenable it would be just as logical to throw all modern boats into discard and replace them with ships driven with some sort of fin arrangement which followed closely the fish method of propulsion.

It is true that the study of bird flight has been of great value in the development of human flight and it is probably equally true that man has still much to learn from this study, but the results of this study have shown, and possibly will continue to show, that the wing-flapping type of aircraft is not likely to be developed.

Even a superficial study of birds shows that most of the larger species are primarily not wing flappers, but soarers, and it is from this latter class that most of the beneficial knowledge has been obtained and applied to airplane design. All attempts of inventors to produce a practical wing flapping craft have signally failed, but apparently this is a class not easily discouraged.

One of the more promising developments in this line of aircraft is now being completed in Austria. The inventor, Carl Czerny, produced several working models before the war and was working on a full size

(Continued on page 178)

Rail FLYER to Set New SPEED Marks

THE rail flyer, the inventor has called this new space-consuming creation of engineering, and it has several very good reasons for its existence.

It is so constructed that it is able to overcome one of the great problems of rapid transportation; the problem of traction. Every vehicle has tractive power, the ability to move forward under applied force.

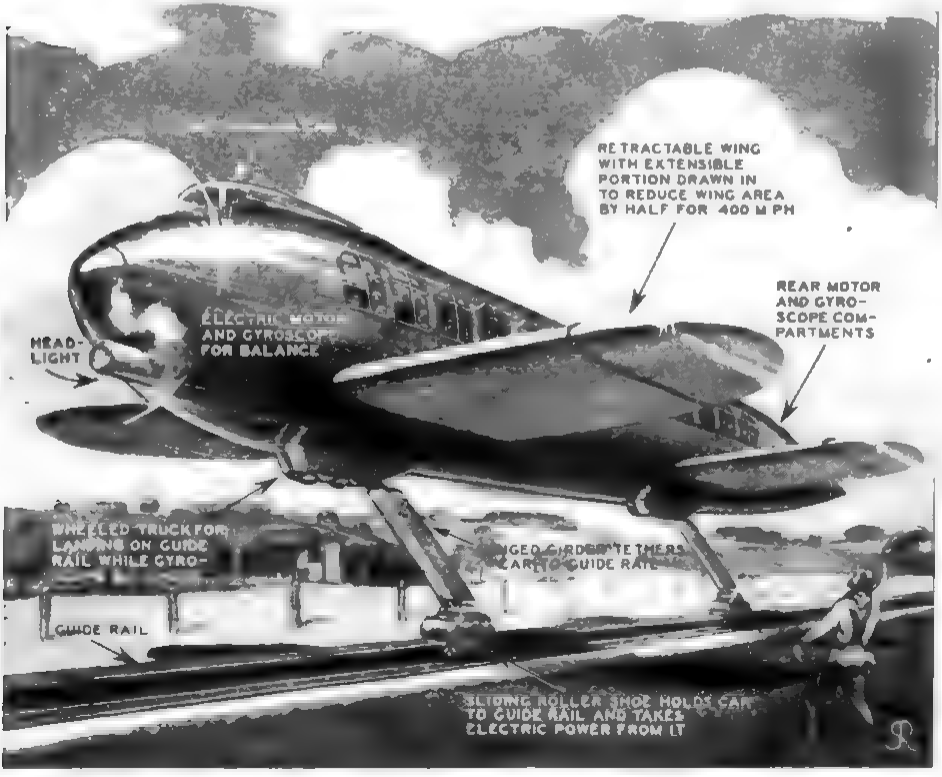
When these great pieces of buzzing, roaring mechanisms like those used by Capt. Campbell at Daytona Beach, reach their maximum speeds of over two hundred miles per hour they are getting close to the limit of traction; that is the limit where, due to the great force applied to the wheels, the wheels will do nothing but slip helplessly around. As a matter of fact, in these supermachines, a great deal of the energy fed to the wheels is dissipated in this manner.

Anybody who has had the opportunity of holding the hand on the tire of a racing car after it has been driven at the rate of a hundred miles per hour for several hours will be very forcibly reminded of this loss of tractive power through excessive speed. The tires will be so hot that they will almost burn the hand.

With the still greater demands for speed and more speed, the engineers are beginning to ask themselves when, due to the problem outlined above, we shall have reached the limit.

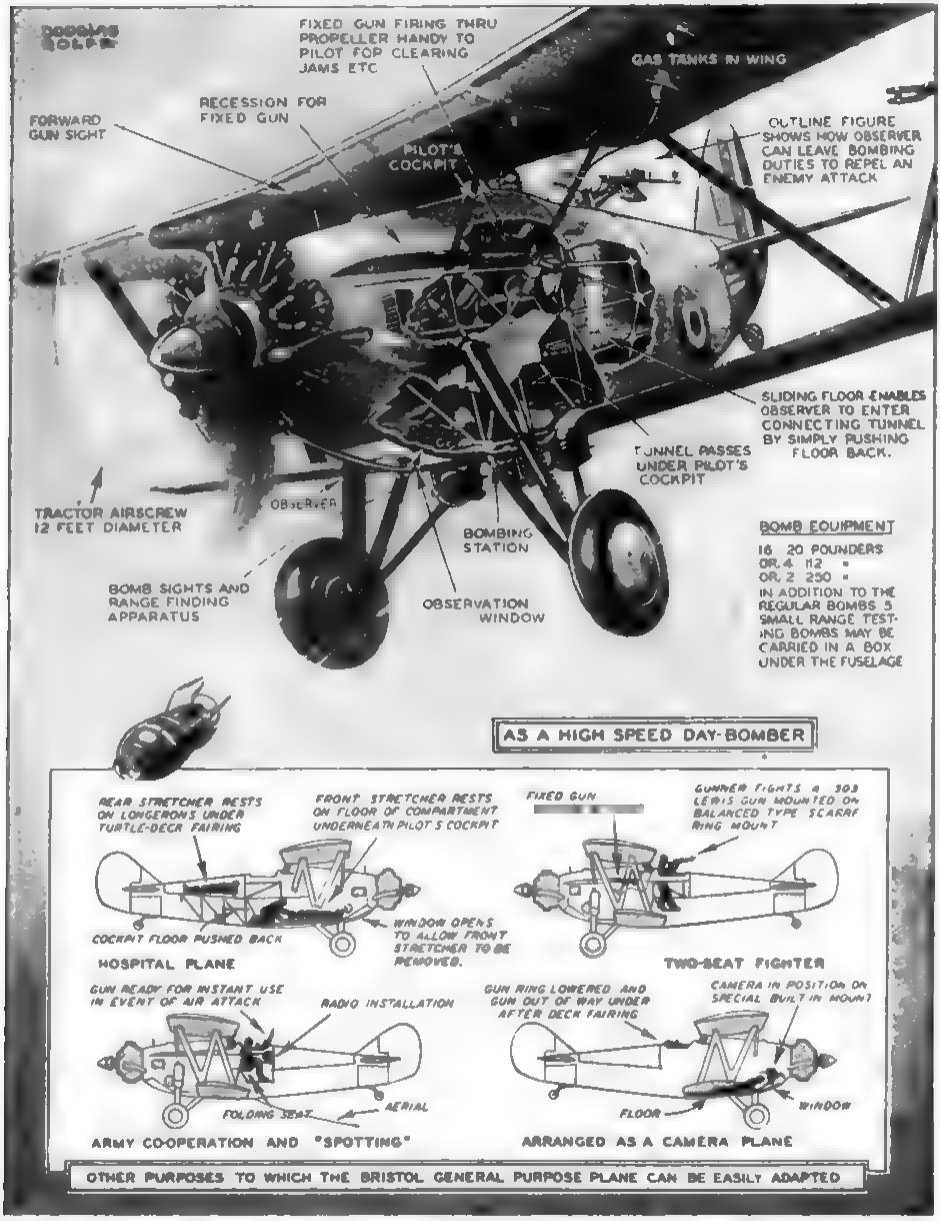
But why not take to the air with planes that will not have to depend upon weather conditions; planes that will move through fogs, snow and wind as easily as do our largest and most powerful locomotives. Not only will they do this but they will also reach prodigious speeds of over five hundred miles per hour by practically eliminating all friction with solid materials.

The rail flyer will do these things. It really amounts to a captive airplane, which, when its power is turned off, will descend gently to its guiding rail, its gyroscope holding it perfectly vertical even in the face of driving winds. Surely this would provide new luxury of travel with one hour between New York and Buffalo and a little more than two hours between New York and Chicago.



Flying by rail. It is expected that this method of travel will overcome traction difficulties encountered at extreme speeds.

British War Plane Has Novel Features

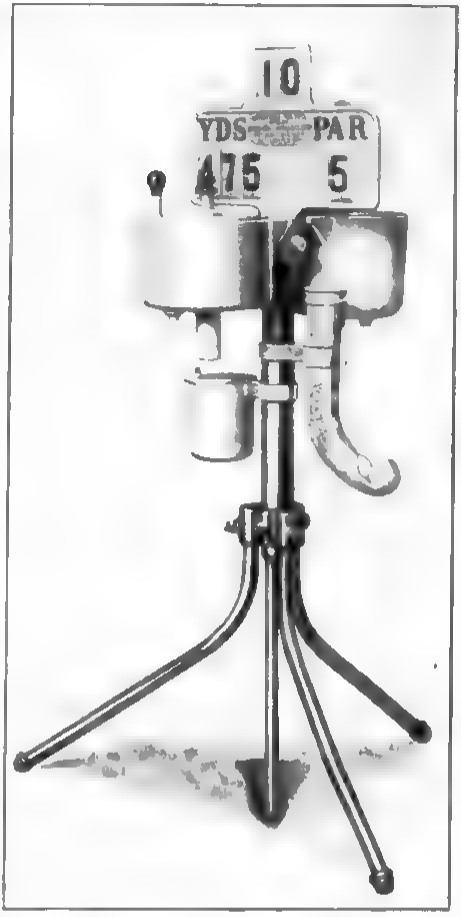


The new Bristol General Purpose Military Biplane is remarkable for its special construction features which permit it to be used for a variety of purposes without requiring special equipment. It is so arranged that it may be used as a fast two-seat fighter, or alternatively as a camera plane, a day bomber, a regular artillery "spotter" or even as a hospital plane. Used as the latter it carries two stretchers and an attendant as well as the pilot. The high speed, which at ground level is only 140 m.p.h., increases to 163 m.p.h. at 12,000 feet. Climb is roughly at the rate of 1,000 feet per minute.

For Golfers—Ball Washer, Tee Marker and Rack in One

OF ESPECIAL interest to golfers is a new tee rack now being marketed, which performs a number of necessary tasks, ranging from giving information as to par for the hole to washing six golf balls and delivering them in a rack ready for use.

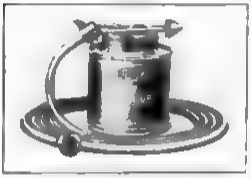
The contrivance washes the balls by means of a set of rotating brushes, which are swished around with a handle on the upper brush. A spider holds the six balls, so that they can all be dipped in the cleaning solution at one time.



In addition to serving as a tee marker, this contrivance also washes golf balls with rotating brushes, and delivers them in rack thoroughly cleaned and ready for the game.

Spray Attachment for Paint Cans

WITH a new paint spray attachment now on the market, craftsmen will find it unnecessary to fuss with the paint as it comes in the cans. The lid is simply removed, and the appliance screwed in place to take the place of the lid, as illustrated in the accompanying drawing. Air under pressure is delivered to the nozzle by means of a rubber hose, which comes as a part of the device.



This new paint spray attachment attaches to can in place of lid, taking air under pressure through the rubber hose.

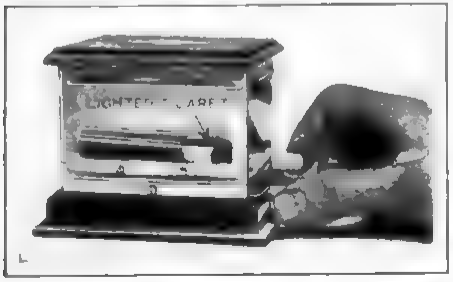
You Can't Tell Your Own Voice

THE voice we hear the most often and which we imagine we know the best—our own voice—is totally unfamiliar to almost all of us.

This interesting fact has been proved through thousands of "home recording" tests, during which a number of different people made records of their voices. When these records were played back each one was able to pick out the voices of his friends, but could not recognize the record he made himself.

Anyone doubting this can try the experiment on a home recording device or a dictaphone for further proof.

Smoking Now No Effort at All—Dispenser Gives You Lighted Cigarette



Easy pressure of forefinger on lever of this electric dispenser delivers cigarette fully lighted and ready to smoke. Space occupied on the desk is less than for usual holders.

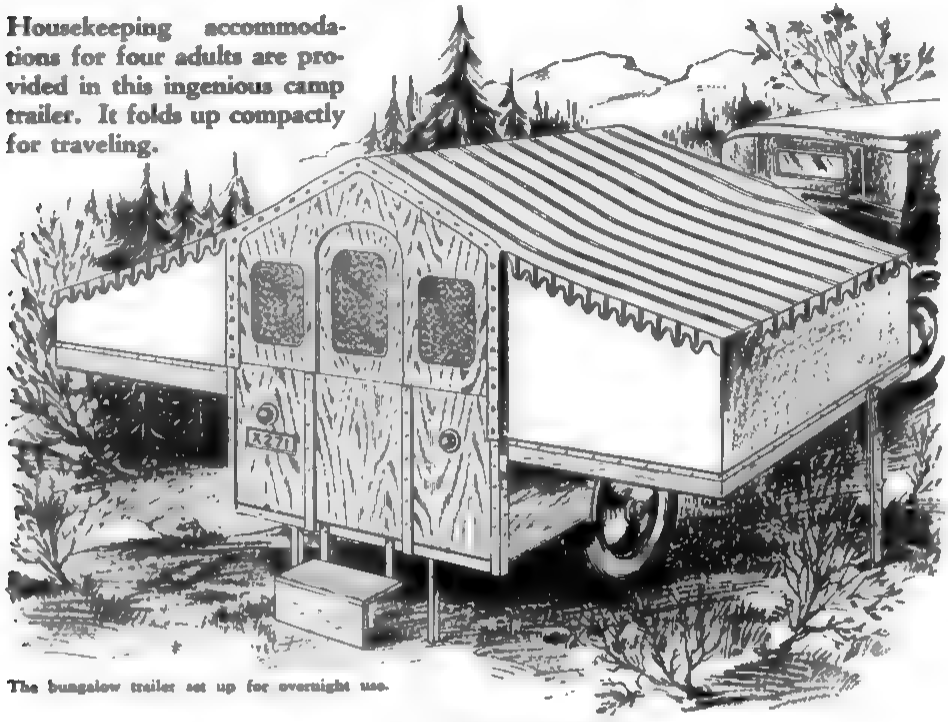
SMOKING is coming to be such a convenient matter that it is a wonder any of us can resist becoming insatiable cigarette fiends. The latest device to ease the labor of lighting up a fag is an electric desk dispenser which delivers one cigarette at a time, fully lighted and ready to smoke.

Shown in the accompanying photo, the dispenser holds one package of cigarettes at a time, and is operated by the easy pressure of the forefinger against a lever. The fag, with its end aglow, pops out of a little aperture at the side.

The dispenser is surprisingly small, and is designed to take the place of individual holders and lighters occupying twice the space.

A Bungalow Trailer

Housekeeping accommodations for four adults are provided in this ingenious camp trailer. It folds up compactly for traveling.



The bungalow trailer set up for overnight use.

by **DICK COLE**

UNDOUBTEDLY the neatest and most convenient way to "autocamp" is with a self-contained, built-in trailer. A number of excellent camp-trailers are offered on the market, and are commended for the consideration of anyone planning an extended camping trip. But there are those whose pocket-book will not stand even the nominal cost of a ready-made trailer; and there are legions of amateur builders who find keener joy in putting to practical use creations of their own handicraft. To these, this article on how to build a bungalow trailer will be of particular interest.

The cost of building this trailer is not excessive—no more than the cost of a complete, reasonably-priced camping outfit with tent, etc. Its advantages over the running board camping outfit are manifold.

First, the members of the camping party are not packed in like sardines with the camping paraphernalia. No ungainly parcels are lashed to the car to chafe the paintwork. The beds are always off the ground —one does not have ticks and crawly things for bed-fellows.

When passing through cities with points of special interest, the trailer can be checked at a parking station, leaving the car free for side trips. And, above all, the bungalow trailer offers home-like conveniences that can not be had by tent camping.

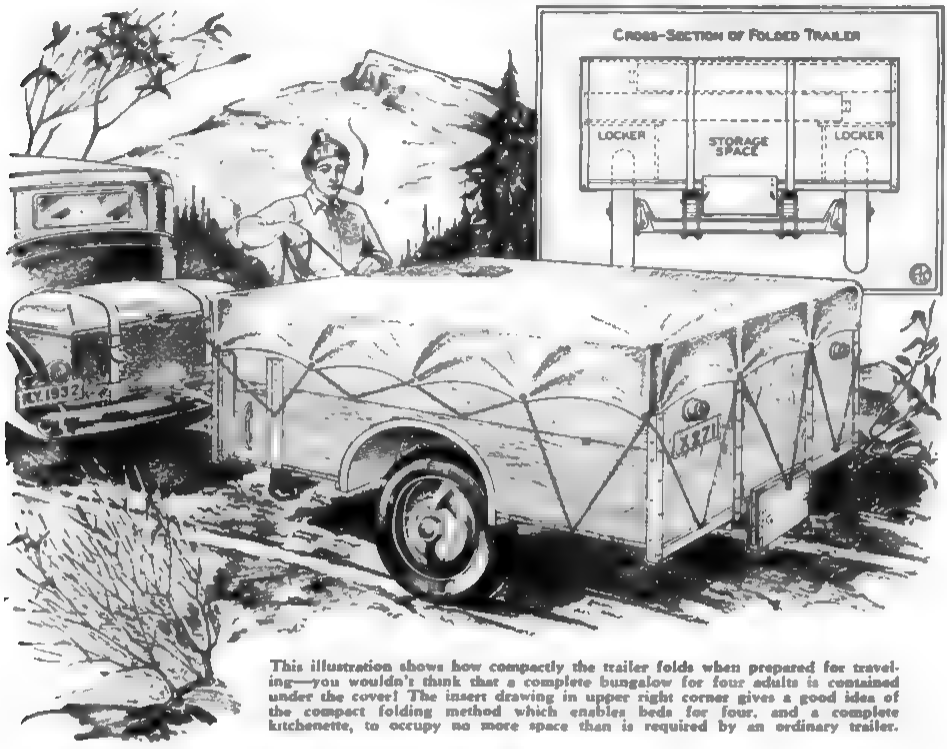
It is a mistaken idea to assume that a trailer materially impedes traveling. It is a fundamental engineering law that more weight can be hauled than can be carried by a tractive machine. No doubt an automobile is put to more undue strain carrying a 500-pound camping outfit, than by hauling a 1000-pound trailer.

Trailer Does Not Impede Speed

And, too, if the trailer is low-built, and is hooked up close to the towing car, the official speed limit of any state can be maintained without undue effort. The only time the trailer will make its presence felt is on steep grades, when a change to lower gear will have to be made a little sooner. But makers put gears in the gearbox for just that purpose.

The cost of building this bungalow trailer

for AUTO CAMPERS



This illustration shows how compactly the trailer folds when prepared for traveling—you wouldn't think that a complete bungalow for four adults is contained under the cover! The insert drawing in upper right corner gives a good idea of the compact folding method which enables beds for four, and a complete kitchenette, to occupy no more space than is required by an ordinary trailer.

will depend somewhat upon the builder's shopping acumen at second-hand shops. The primary unit that enters into the construction is the front axle assembly and part of the frame from the chassis of a junked car. Scores of these are available for a song at any automobile graveyard. Various sizes of angle-iron are used. Often this can be picked up cheaply at places dealing in second-hand building material.

Ply-board is used extensively. Water-stained or slightly damaged ply-board can often be had at lumber-yards at greatly reduced price. But even if all new material is used—except the axle, wheels, etc.—the cost will not exceed $40.00. The biggest item that enters into the construction is one's time.

Trailer Blueprints

Large-size shop blueprints made from the original drawings accompanying this article, are available at $1.00 per set from the Blueprint Department of Modern Mechanics and Inventions, 529 So. Seventh St., Minneapolis, Minn. They are genuine blueprints intended especially for workshop use.

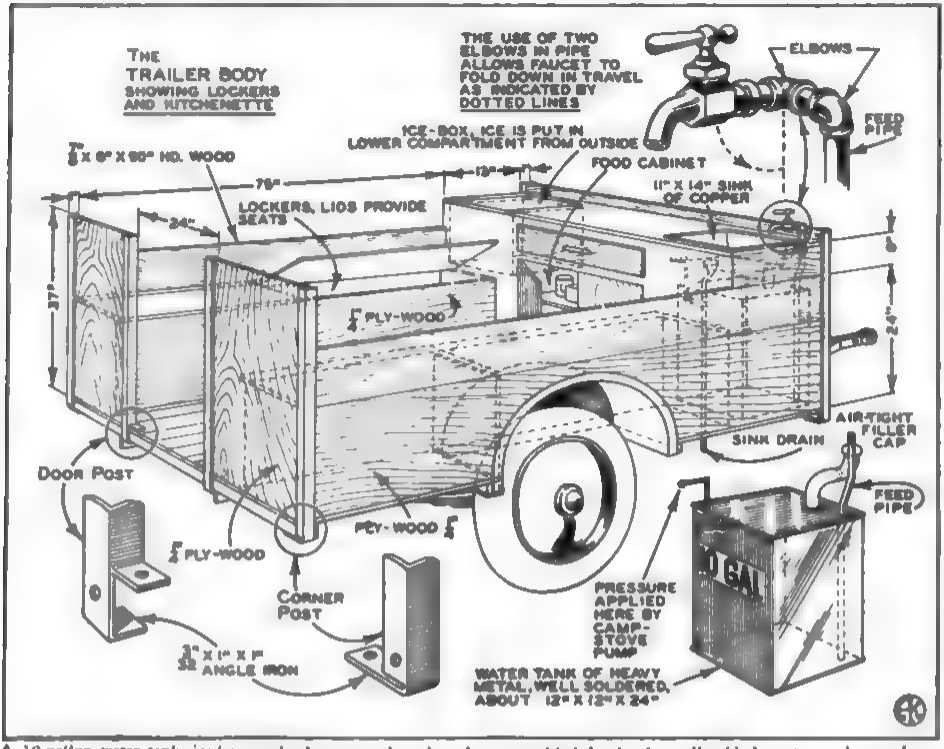
The first consideration of the builder is the selection of the front axle assembly. The style shown has semi-elliptical springs. Axles fitted with transverse springs, as the model T Ford, are not suitable. Axles with cantilever type springs, as old model Chevrolets, are not desirable. Many light cars have the semi-elliptical.

Points to Look For

Points to consider in the selection are: low hung frame, reasonably well-fitting shackle bolts, good wheel bearings and wheels fitted with a common-size, small tire. It is highly desirable to have the same size tires on the trailer as on one's car. The car spares will then do for the trailer in case of a puncture. Sloppy king bolts and bushes are not objectionable; the axle will be made rigid at this point.

After one has found the axle he wants, and made a dicker with the junk man, the frame is cut through with a hack-saw 4 in. back of the shackle bolt, and the assembly hauled home. The next operation is to lock the wheel axles rigidly to the axle

Water Tank and Plumbing System Occupy One Corner of the Trailer



A 10-gallon water tank, ice-box, sink, drawers and cupboard are provided for in the trailer kitchenette as shown above.

proper. One of the drawings shows how this is done. Invariably the king-bolts are too hard to drill—the temper must be drawn first. So the bolts are withdrawn and heated to cherry red in a fire. They are then covered with ashes and permitted to cool down slowly.

After replacing, the bottom nut is drawn up as tightly as possible. Then 5/16 in. holes are drilled through the stub axle and the axle yokes, and tight-fitting steel pins are driven in. Of course, the wheels should have been lined up first. A ¼-in. toe in is permissible. After the axle has been made rigid, all steering arms and rods can be removed.

Building the Chassis

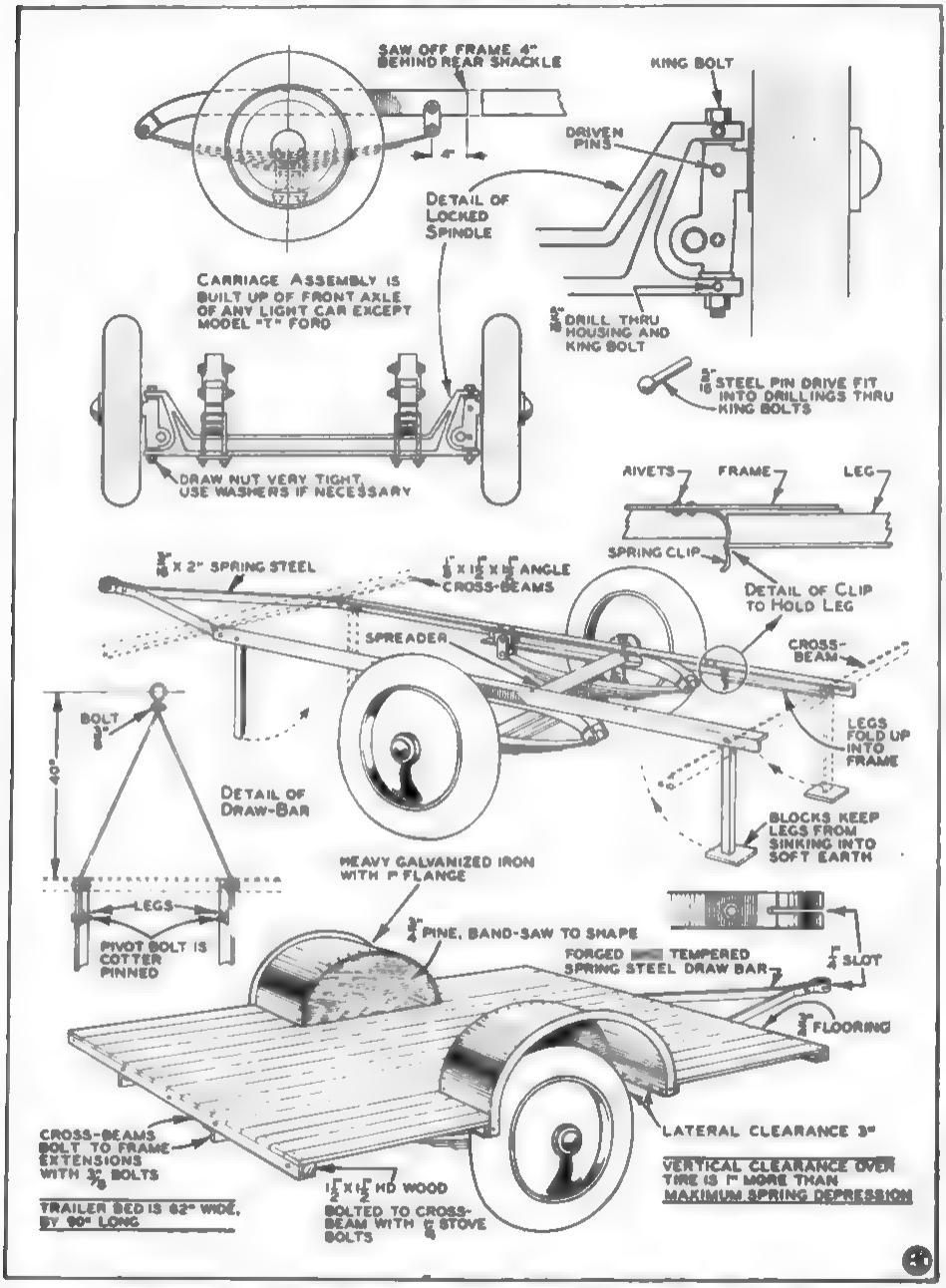
Construction work now begins in earnest. Two lengths of ⅛"x2"x2"x90" angle-iron are bolted to the short section of the original car frame. Three ⅜" flat-head machine screws are used on each side. The heads are counter-sunk, and the nuts should be riveted over after drawing tightly. 3/32"x1½"x1½" angle-iron is used for the legs, which fold up into the frame and are held with spring clips. Several laminations of old phonograph motor spring will make these clips.

The drawbar is now made; 3/16"x2" spring steel stock is used here. It is best, perhaps, to have a blacksmith, or a shop specializing in auto springs, shape this drawbar. Note that the bar terminates in a slotted loop, which will permit quick attachment to the bar of the towing car. One of the leg bolt-holes can be used for the drawbar. A second bolt, however, is necessary. The nuts of these bolts, too, should be riveted over.

Now turn to the drawing showing the flooring in place. The cross stretchers are four lengths of ⅛"x1½"x1½"x62" angle-iron with a square strip of hardwood bolted into the angle. The purpose of the wood is to provide stock to which to nail the floor boards. The cross members are bolted to the main stretchers and the nuts riveted over; ¾" pine will serve as flooring. Afterward this can be covered with battleship linoleum if desired.

The construction of the mud-guards is quite obvious. Heavy galvanized iron is shaped over semi-circular pieces of wood and screwed to it at close intervals. The galvanized iron should overlap the side about 1". This 1" overlap is then peaned back to form a flare. Later this is screwed to the side-wall of the trailer. The clearance between the top of the tire and the mud-guard should be about ½" more than the maximum depression of the car spring;

Front Axle of Light Car Used to Build Up Bungalow Trailer Chassis

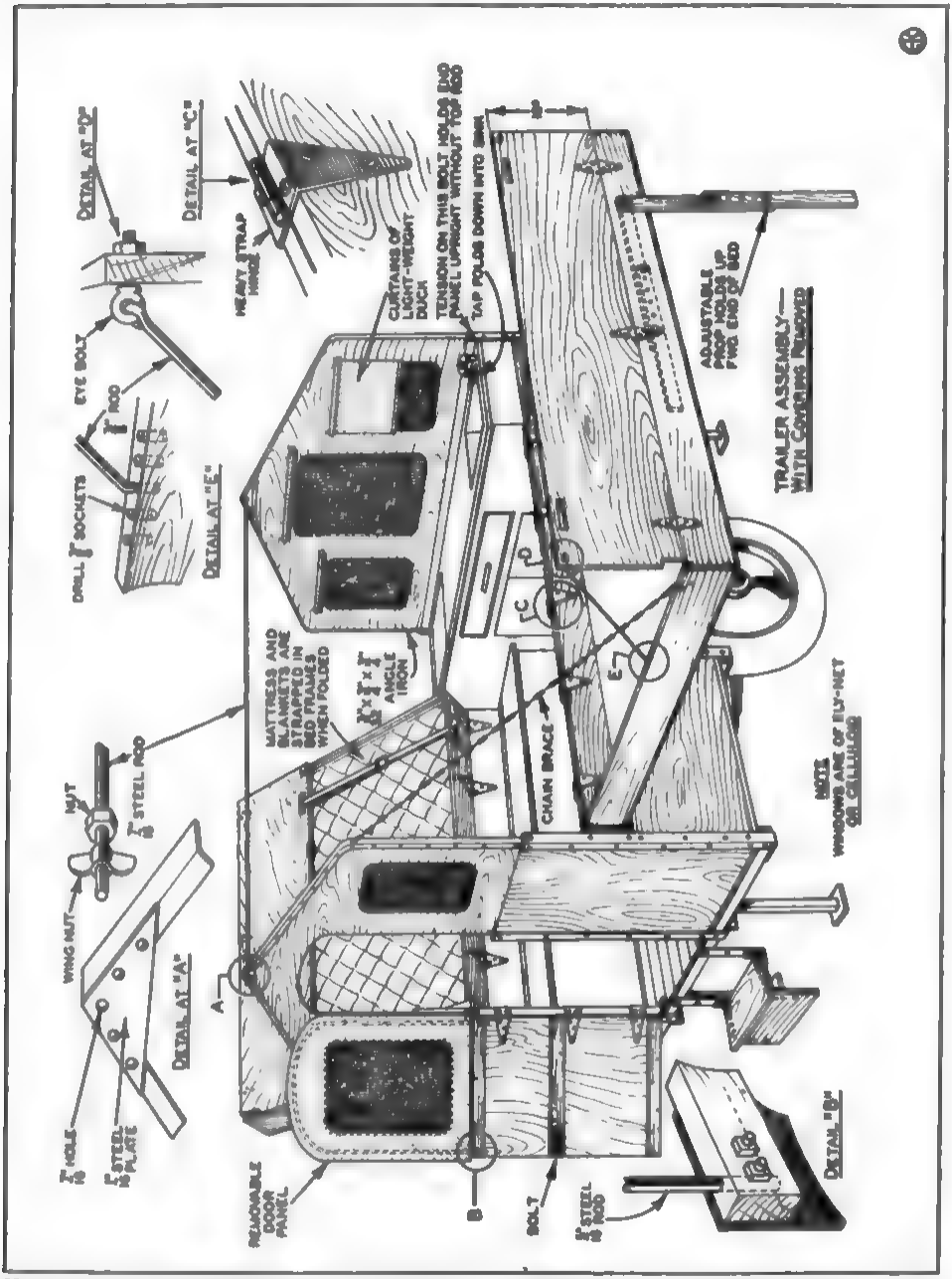


Details of chassis, built up out of front axle, and floor construction are clearly shown in this detailed drawing.

3″ is ample for the lateral clearance. The width between the mud-guards should be as great as possible—2″ clearance between the side-walls of the tires and the semi-circular boards is sufficient under normal conditions, since tire chains will never be necessary on the trailer wheels.

Another drawing shows some of the

Details of the Complete Set-up; Note the Built-in Kitchenette and Sink

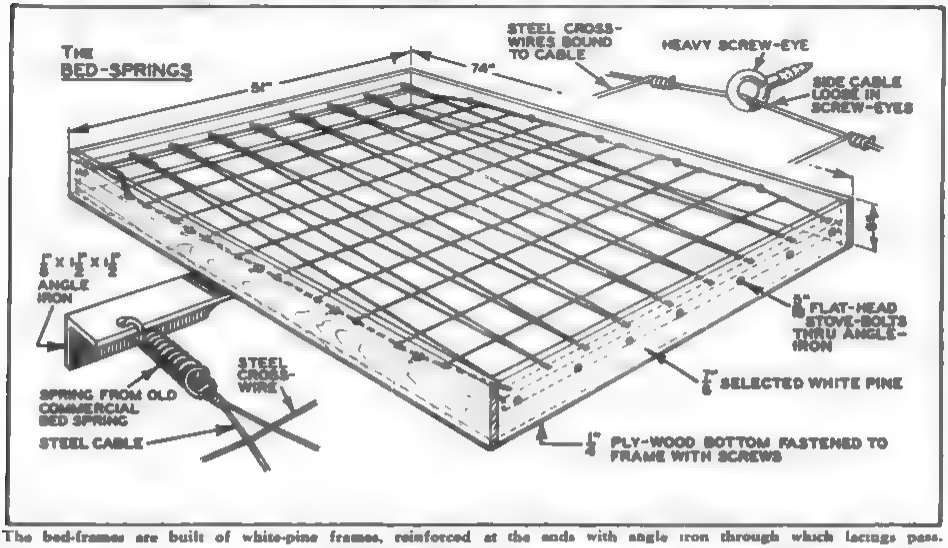


Here we have a view illustrating how the hinged sections of the home-made trailer open when setting it up for use.

stages of the cabinet work. The perspective drawing shows the general layout and gives the salient dimensions. The insert drawings show hidden detail construction, so a long-winded discussion of all the detail work would be superfluous.

The kitchenette at the rear is one of the main features. Incorporated in the space 13″x30″x60″ is an ice-box; a drawer for kitchen utensils, cutlery, etc.; a cupboard

Two Folding Beds Are Built Right Into the Bungalow Trailer Frame



The bed-frames are built of white-pine frames, reinforced at the ends with angle iron through which lacings pass.

for pots, pans, and foodstuffs; a 5″x11″x14″ sink; and a ten-gallon water tank. The locations of these are designated on the drawing.

The ice-box compartment should be lined with a heat insulating material—balsa wood, cork, asbestos, magnesium. The ice is put in through a door on the outside of the trailer. While the cooling effect is not as good with the ice below the foodstuffs, it will serve satisfactorily. The foodstuffs are accessible through a hinged lid on the top of the cabinet.

Water-Tank Plumbing

The water-tank, and its operation, is a rather unique feature. The tank fits in the lower, right-hand corner of the cabinet. The tank can be approximately 12″x12″x24″. An auto junk yard will provide the gooseneck filler, which will permit the tank being filled from outside. The water pipe is fitted with two elbows at the top so that the faucet can be turned down into the sink when the trailer is folded. Air pressure is applied to the tank by leading a copper tube to a convenient point on the front of the cabinet. A tire valve is soldered to the end of the pipe. The ordinary camp stove pump will contribute the pressure.

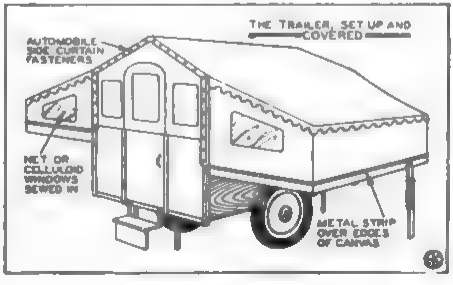
Note that the corners and the door opening are reinforced with angle-iron. And note particularly the ⅞″x8″x90″ hardwood stretchers which give solidity to the body. Lockers with hinged lids are built over the wheel housings. These serve for storage space and for seats. The seats can be upholstered with thick felt and leather. Again, the junk yard will provide the leather.

Look at the drawing showing how the folding beds are built in, and the erection of the front and back walls. Note how the beds are hinged to the hardwood stretcher. They are not symmetrical. To design the beds so that they will fold one on top of the other, it is necessary that one be higher than the other when opened. This means that they must be hinged differently.

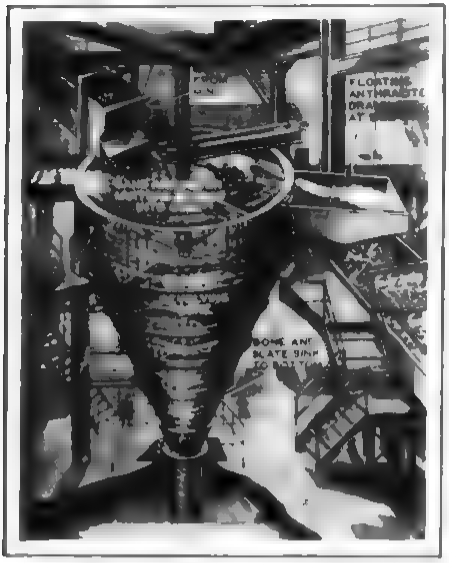
The upper section of the end walls is 5/16″ plyboard and is hinged to the lower, permanent section so as to fold inward. The edge of the plyboard is faced with 3/32″x¾″x¾″ angle-iron. A 94″ length of 7/16″ galvanized iron round rod is stretched between the tops of the end walls, and later serves as a support for the canvas roof. Windows can be cut in the end walls and celluloid or fly-netting with roll curtains used here. It is not well to use celluloid for the middle, rear window, as the camp stove will be located at this point and there is a fire hazard.

Note that a chain supports the beds at one end. However, chain can not be used satisfactorily at the other end, as the cabinet forms an offset, and the chain would not offer a direct support. A folding leg on the outside provides a solid support. Note that leg is adjustable to uneven ground.

(Continued on page 180)



Water and Sand in Revolving Cone Clean Anthracite Coal



The slag falls to the bottom of the cone because of its higher specific gravity while the coal remains at the top.

ONE of the newest methods of cleaning anthracite coal is the use of a revolving cone as shown in the diagram on the left. Newly mined coal is sent to the cone through a chute, being emptied into it at the top. The cone is then filled with sand and water which is mixed into a solution with the coal by the revolving action of the cone.

In the mixing process the bone and slate, freed from the coal and because of their higher specific gravity, fall to the bottom of the cone from which they are removed at intervals. Likewise, the coal—because of its lower specific gravity—remains on the top of the cone and is drawn off.

Drinking Fountain From Faucet

ANY water tap can be quickly converted into a drinking fountain by using the attachment shown in the accompanying photo. The water is cleaned and filtered while being forced through the device and emerges in a convenient upward stream. The attachment is nickel plated and by means of the threads and set screws can be made to fit on any type of faucet. The nozzle can be turned upward when a drink is desired or turned down when drawing water for other purposes.

A drinking fountain by merely turning up this special nozzle.

New Dirigible to go 200 M.P.H.

CONSTRUCTION on an all-metal dirigible expected to attain a speed of 200 miles an hour is scheduled to start within a short time, according to word given out by a Los Angeles corporation.

The ship will thus be capable of gaining greater speed than present types of lighter-than-air craft. Two propellers will be placed in the tunnel as well as the auxiliary orthodox propellers extending to the outside of the metal bag. The craft will be slightly smaller than the Los Angeles.

Hand Warmer for Cold Days

A "POCKET heater" or "hand warmer" about the size of a cigarette case has recently been placed on the market. The small heater has a perforated cover and contains a reservoir for benzine. The asbestos wick is protected by a metal grid and will glow for twenty-four hours continuously on one filling. Heat will not damage pocket.

This warmer will give off 120 degrees of heat, fits in pocket.

Disk Propeller Has Advantages

THIS queer-looking arrangement of disks, shown below, is the newest thing in aircraft propellers according to Guido Tallie, of Rome. He believes that the results obtained by these four disks, so arranged, is superior to that of the usual blade type. Metal arms capable of withstanding great strain hold the disks in place.

The whirling motion of these four disks is claimed by the inventor to be superior to that of the blade propeller.

SPARKS from the RADIO EDITOR

Edited by [illegible]

Making R. F. Choke from old Transformer

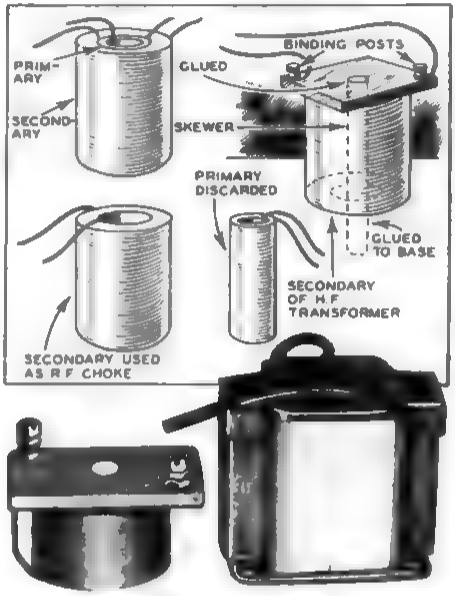
WHEN an audio transformer "goes west," don't throw it away because many good uses can be found for it in some way or another. One use is that of an RF choke as suggested in the accompanying sketches. Here is the way to make such chokes from old transformers.

Remove the transformer shell and then pull out the core laminations. We are assuming, of course, that the secondary of the transformer is good because it is usually the primary that burns out.

Remove Core From Windings

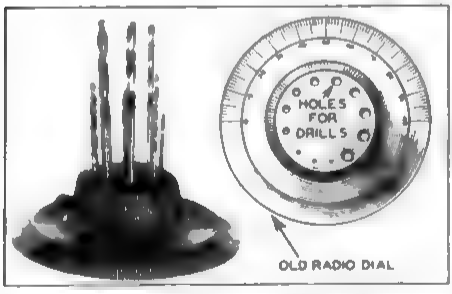
With the core removed all you have left is the windings. Place the windings in a pan of hot water for a few moments until the paraffin between the two windings softens. Remove the coil and, with a blunt stick, carefully push the primary out of the secondary.

To mount the secondary, place it end down on the baseboard and cut a piece of cigarbox wood to fit over the top. Fit a binding post in each corner and attach the leads to them, then drill the center of this cover and drive a skewer down through it into hole in the base. By gluing each end of the skewer you will have a firm mount.



To mount the R. F. choke, remove primary from secondary and secure the latter to baseboard with a skewer, as shown.

Drill Holder From Old Radio Dial



Bore holes around edge of dial knob as shown in drawing.

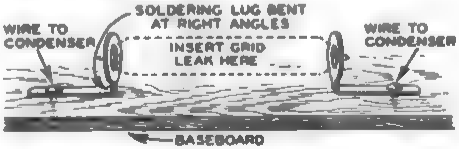
EVERY radio builder who has a set of small drills will want to build this little drill holder because it is so convenient. All it requires is an old radio dial.

Count the number of drills and then make as many spots on the small portion of the dial as there are drills. Put each drill in the chuck and use it to make its own supporting hole. Then insert the drill as shown and you have a convenient drill holder.

Lugs Make Grid Leak Mounting

HERE is an extremely simple way of making an improvised grid leak or resistor mounting. Choose a pair of lugs with center holes of a size to fit the ends of the leak, and drill a small hole through the shank. Then bend each lug at right angles as shown in the drawing. Mount these on the baseboard by means of screws and set the resistor in place.

Taps are taken off at the screw which are placed in holes already drilled in the lugs. Press lugs apart to remove resistor or leak from the holder.



Mount lugs on baseboard and insert leak in place as shown. Press the lugs apart when you wish to remove the leak.

Two-Tube RECEIVER Gets

by THORNTON HALLET

Believe it or not, but with this little receiver only two tubes are required to bring in short wave programs on a loud speaker. Not only that, but construction costs are reduced to a minimum, since a discarded broadcast receiver will furnish most of the necessary parts.

NOW that the pentode tube has become an established fact it is time the short wave listener or transmitting station owner made use of it in his receiver. First because of the fewer number of stages of amplification necessary to bring in good volume and secondly because of the reduction of cost.

In the short wave receiver shown in the sketches and photographs, only two tubes are used. The first is the detector consisting of a single 224 type. This feeds directly to a 247 type pentode and its output directly operates a loudspeaker.

For good reception, however, two things are essential. First a power pack delivering 250 volts with intermediate voltages and secondly, a dynamic speaker.

Loud Volume on Dynamic Speaker

Other speakers will work of course, but with the special output transformer necessary to handle the power output of this tube the speaker must be one capable of handling the fluctuations in output to best advantage.

The receiver as shown was built entirely of parts used in other receivers except the output transformer. This should be one with a primary impedence of around 8000 ohms to handle the output.

The tuning condensers were those of ordinary capacity cut down to suit. No panels were used, to cut cost and make all parts accessible.

The baseboard can be any suitable board about 15 inches long and 8 inches wide. Mount a UX socket at the rear left end and in the middle rear and right rear mount two UY or five prong sockets.

Arranging Parts on Baseboard

A binding post strip or suitable Fahnestock clips can be placed along the rear edge for power connections. The builder can suit his own convenience about part placements, the only thing to observe being that the two transformer windings should be set at right angles to each other.

As will be seen in the plan photos (Figs. 1 and 3); the .00015 variable condenser is placed at the extreme left front, then the .00035 variable, then the 0 to 3000 ohm potentiometer and at the right end the audio transformer. Behind the audio transformer mount the output transformer.

Gridleak, other resistances and fixed con-

Fig. 1. All parts of the short wave receiver are mounted breadboard style, as shown here.

Material for the set can be obtained from an old broadcast receiver, and assembled in your workshop with only small effort.

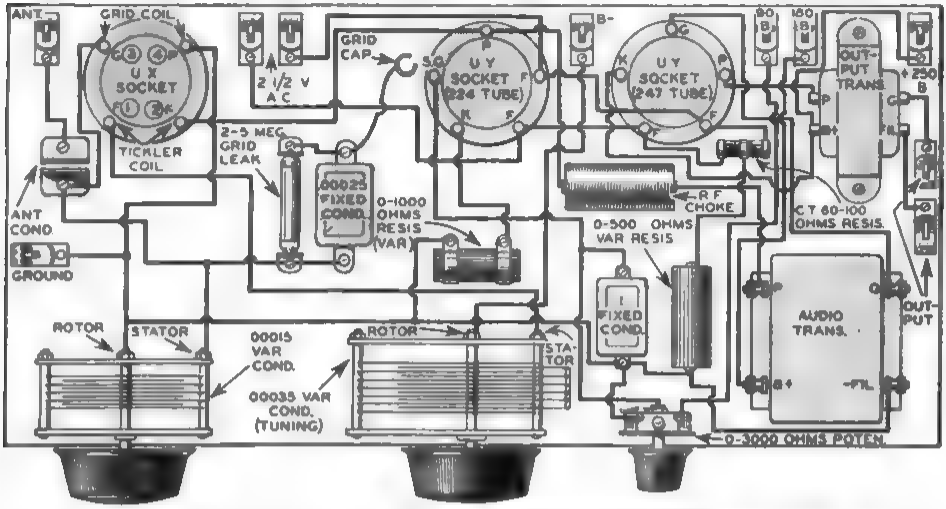


Fig. 2. Arrange parts in about the positions shown in baseboard layout plan above. Fahnestock connector clips are secured to rear and sides of baseboard, with tube sockets set slightly forward. Note that two transformers rest at right angles to each other. Socket at extreme left takes plug-in coils.

densers can be distributed as desired. The antenna coupling condenser is shown as a small midget but for sake of economy it can consist of a pair of small metal plates mounted vertically and about a sixteenth of an inch apart. This is shown in Fig. 4.

Sharp Tuning With Var. Antenna Condenser

All tuning is done by the .00035 condenser. If the variable antenna condenser is used, however, in place of the fixed condenser, it will materially assist in clearing up sharp and critical waves.

In installing the 224 detector remember that the regular grid or "control grid" is represented by the cap at the top of the tube. This can be clamped by a common small battery clip and leads directly to the grid leak.

If no RF choke is handy wind about 300 turns (scrambled if desired) or No. 32 or No. 34 DCC wire on a small silk spool.

The 0 - 1000 ohm resistor can be one provided with a slider if no real variable is handy. Once the best setting is found the slider should be locked in position. As a 224 takes about 350 ohms as bias resistance this setting can be readily found within that range provided.

Adjusting Center Tapped Resistor

The center tap resistor in the pentode circuit will probably give best results at approximately 425 ohms. If a fixed resistor can be procured at that ohmage it will save one adjustment to make.

Wire up this receiver exactly as shown in the diagram. (Figs. 2 and 5.) A detail

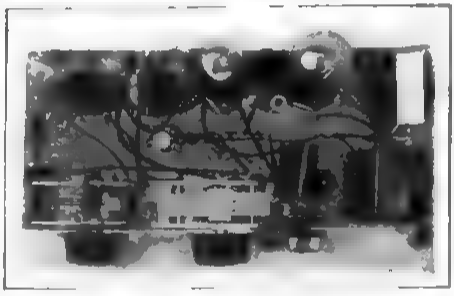


Fig. 3. Photo here shows the placing of parts on the original receiver. Tuning and adjusting of volume is done with the two variable condensers and the potentiometer.

sketch (Fig. 4) shows how the connections are made for the pentode tube in a regulation 5 prong socket.

Note that the terminal marked K or C for cathode must be connected to the screen-grid of the pentode, and the control grid from G on the audio transformer connects directly to G on the socket.

The third grid of the pentode tube has no external connection.

Wiring Up the Filament Circuit

Both filaments can be connected in parallel or wired to a separate source, just as you desire. If the filament transformer is center tapped then the 0 to 500 ohm resistor can be connected right at the center tap and to B minus (ground), instead of using the center tapped resistor at the tube socket. Fig. 4 shows the wiring diagram.

There is no need to instruct in wiring up this receiver except to follow the diagram in Figs. 2 and 5 implicitly. Make all leads as short as possible and take care to

make connections right at the four prong socket for the tuning coil.

It might also be mentioned that special tuning condensers need not necessarily be purchased. Just recover the plates from oversize broadcast condensers and they will serve just as well.

For the .00035 condenser you will need approximately 7 rotors and 8 stators. For the .00015 condenser try 3 rotors and 4 stators.

If by any chance you cannot readily remove the stator plates leave them in as those that do not mesh with the rotors will have little or no effect on the capacity of the condenser.

The plug in coils are clearly shown in Fig. 6. Remove the glass from an old tube, clean out the base, melt solder from prong tips and pull out the leads. Then drill out the prongs clean with a very small drill.

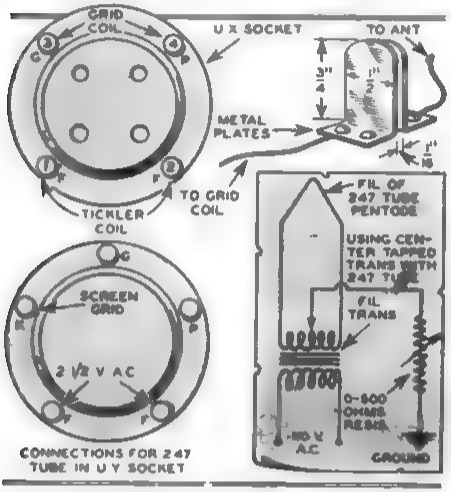


Fig. 4. Construction of stationary antenna condenser is shown in upper right drawing. Top socket illustrates connections to plug-in coils. If you use center-tapped transformer, wire up filament as shown in lower right drawing.

Constructing the Plug-in Coils

Coils are wound to conform with the coil socket connections, so do not wind them in any other manner except as herein described.

Drill four holes diagonally in the side of the base as shown. First wind the grid coil. Scrape an end of the magnet wire and run it through the top hole of the base and down through prong 4.

Bend the wire over the prong and secure it with a drop of solder. Then wind on the designated number of turns tightly and closely, and push the end of the wire through the next hole and down into prong 3, where it should be pulled tight and soldered.

How to Wind Tickler Coil

Start the tickler winding in the next hole down to prong 2. Wind on and finish through the bottom hole to prong 1. The two sets of windings should be wound on firmly and in the same direction. Finally carefully file away the excess wire and solder on the prongs so that they fit snugly in the coil socket.

The approximate number of windings for the various wavelengths are shown in Fig. 6. You may have to add or subtract a turn or two to secure oscillation when it comes to the final analysis. The parts used will

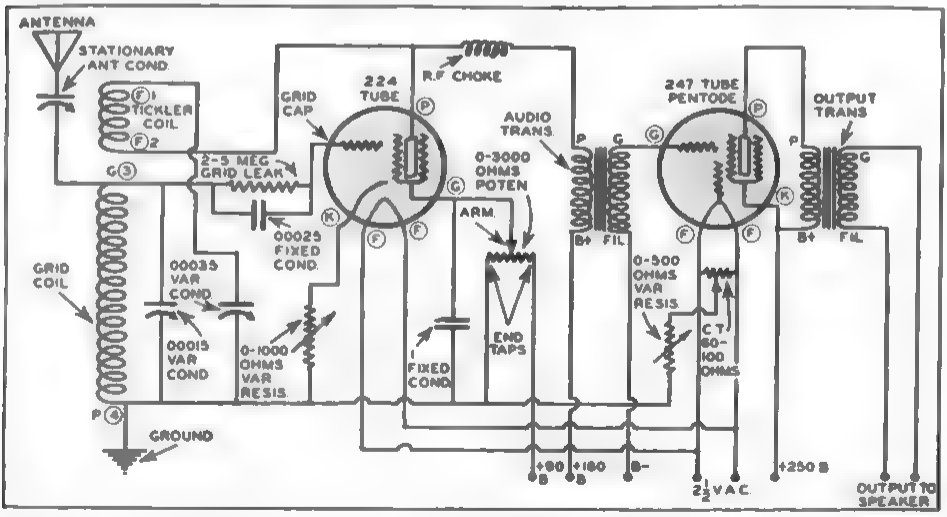


Fig. 5. Wire up the short wave receiver according to the diagram above. The midget condenser shown in Fig. 4 can be substituted for the stationary ant. condenser. With the 224 tube the lead from the 2-5 meg. grid leak hooks to the grid cap with a battery clip. Hook the numbered grid and tickler coil ends to the corresponding prongs on the tube base. If you have difficulty, try reversing tickler connections. Output transformer should have 6000 ohms impedance.

determine this to some extent.

The coil for the 150 meter band will have too many turns to wind on the tube base, so it will be necessary to bolt a larger form around the base to make a neat job.

Separate the tickler and grid turns from each other about an eighth of an inch, but keep the turns of the windings themselves close together.

Finally, with your set assembled and tested you are ready to reach out and bring in some music or short wave code signals. Complete the job by hooking a 40 or 50 foot antenna to the antenna post of the receiver, and ground the set on any good waterpipe or steam radiator.

Tuning is very simple. Allow the 224 about half a minute to warm up and then plug in the speaker. Set the antenna condenser (if adjustable) about half mesh.

Tuning for Stations

Then tune in the station with the .00015 condenser at the same time following it along with the .00035 condenser.

Regeneration is controlled with the latter and clarity and stability further effected by the 0-3000 variable resistance (potentiometer) working into the screen of the 224.

Also don't forget to use a 2½-volt filament source for the two-tube filaments. Five volts will ruin them.

With this little receiver, you have a good outfit to work in conjunction with the "Double-M Special" transmitter described in March, 1932, issue of MODERN MECHANICS AND INVENTIONS, which will be forwarded to you upon receipt of 25 cents. A wave length of 10 to 150 meters can be covered.

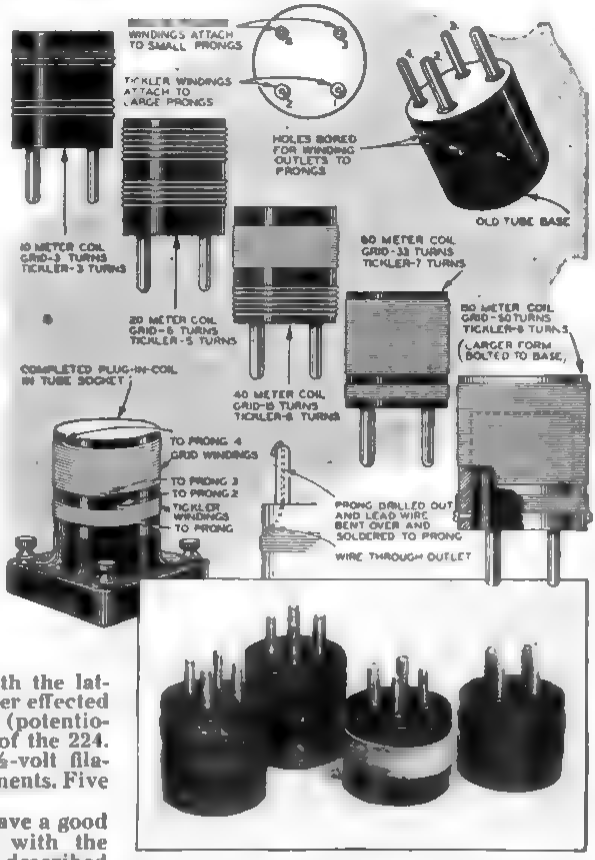
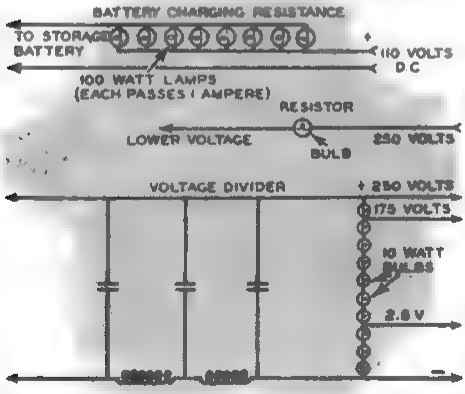


Fig. 6. The plug-in coils are constructed as illustrated in the above photo and drawings. In winding it is imperative that the proper coil and wires run to the proper corresponding prong. Position of socket is at extreme left on the baseboard, as illustrated in the baseboard layout plan in Figure 2. Larger form is required for 150 meter coil.



To charge batteries on D.C. line, wire bulbs in parallel as shown at top. Wire up power pack as shown in lower circuit.

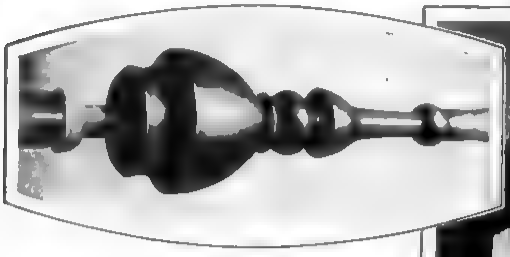
Using Light Bulbs as Resistors

MANY, many times the amateur constructor wants a resistor or series of resistors capable of standing heavy loads. To save money and also to speed up construction, he can use ordinary electric light bulbs as such with good results.

For instance, suppose you want to make a voltage divider for a power pack delivering 250 volts. You want detector voltage, amplifier, screen voltages as well as the final output. In this case you can shunt a bank of 10-watt bulbs across B plus and minus and tap off from the various lamps, as illustrated in the accompanying drawing. This bank of bulbs is, of course, connected up in series.

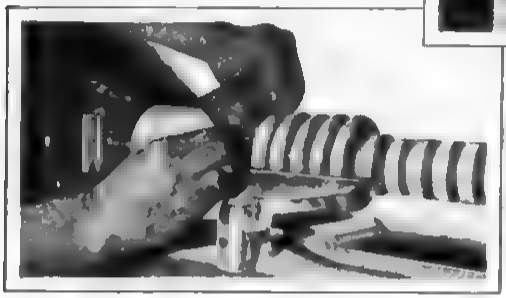
If you live in a D.C. district and have no battery charger you can use lamps as resistances for charging as shown at the left.

Turn Out Curtain Fixtures to Make Spare Time Money

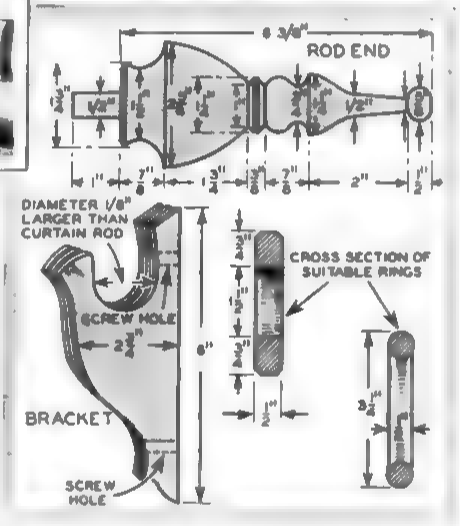


An attractive design for the rod end is suggested in the photo above. One side is turned down so that it can be mortised into the curtain rod and glued.

These curtain rods are highly ornamental as well as serviceable. Note the point at which the rod rests in the bracket, with ends projecting.



The rings are finished right in the lathe as demonstrated above. Small screweyes should be turned into their lower edges for supporting curtains. Note method of sanding.



At top are seen dimensions for the rod end shown in the accompanying photo. Bracket, at left, is grooved for ornamentation. Two designs for rings are given at the right.

NOT long ago a shop owner made a happy discovery. It has since turned him a number of easily earned dollars, and apparently the sideline will continue.

One look at the department store offerings in the line of curtain fixtures convinced this shop owner and basement store proprietor that he could not only make similar articles better, but that he could make them at only a fraction of the price.

This he did, and although three large front windows, two small windows beside the fireplace, and two large dining windows were completely equipped with poles, turned ends, turned wood rings, and brackets, the cost for wood did not exceed $2 — a difference of $11.95 cents saving over the store articles. Besides, for not more than forty cents, all the pieces were stained and lacquered.

And, no sooner had the fixtures been put up than friends began commenting on them. The result you have guessed. This shop owner makes, in spare time, various sets of window fixtures of either his own design, or the design offered by the customer, and not only makes up to $1 or more an hour, but effects a handsome saving for the buyer.

The accompanying illustrations show a popular style of curtain rod end which is turned and mortised into the pole end, two popular types of turned wooden rings which fit over the pole, and a good type of pole bracket.

These are cut on the band saw and sanded smooth. A groove or bead is provided in case a small shaper is available, and after finishing are fastened to the window casings with screws.

The rings and ends are finished right in the lathe and should have screweyes in their lower edges. The poles and flat pieces are polished on a turned piece covered with several layers of clean cloth which is placed between the lathe centers.

The profit and general satisfaction was so great in this particular case that now this handy man watches for new house building permits and often lands a lucrative job by selling the home owner in distinctive fittings for his windows.

Making Artistic Arc-Welded Objects

STUDENTS of an electrical arc welding company's classes have worked out a scheme for making highly ornamental objects which beat all for uniqueness and distinction. In this novel process, which forms a part of their classroom work, they salvage waste metal and convert it into such articles as shown in the accompanying photos.

Any workshop fan handy with an arc welding machine can work out similar objects on his own hook. Though the products are highly intricate, the job isn't nearly as difficult as it looks.

The first step is to scout around a junk yard and salvage any old healthy metal parts you can lay hands on. With your material procured, you next must work out your design, three of which are suggested in the accompanying photos.

These odd pieces of metal must be first fashioned to the shape which you desire, then thoroughly cleaned in preparation for the welding. This step you should do thoroughly, if you expect a good job.

Next the parts are welded together in the customary manner. It will be impossible to explain this process here, since it is expected that you are already expert in the job of applying the welding rod.

It is advisable to begin at the bottom and work upward, since such a method produces a more even grained surface. Work consistently in one direction, that is, 'round and 'round with a spiral motion, or else up and down, depending upon the design you wish to work out.

When you have completely beaded over object to form the surface coating, you can improve on this by going over it with the welding rod to produce intricate designs, or even initials. Your ingenuity in pattern work will help you immensely here.

Metal rods of any kind can easily be fashioned into ornamental desk lights, as illustrated herewith. To say that they are extremely durable would be useless, but you can see for yourself that they are unique and artistic. Wiring is carried out in the customary manner. When the work is completed, the surface should be cleaned by the use of a wire brush or by sandblasting, the latter being preferred, since it produces a finer finish. To complete this finish and prevent rusting apply a couple of coats of bronze lacquer or paint.

Here are three suggested designs for artistic articles which you can turn out with an arc welding machine. Odd pieces of metal are welded first, then beaded over with the rod.

"TUBBY"

A 12-FOOT SAILING SCOW

by **S. S. RABL**

Here's the water baby for you amateur boating fans who want to build and sail your own craft but find that the average job is beyond your means or your ability to construct. "Tubby" is a sailing scow that can be handled safely in any water fit for small boat sailing, while the construction is simplicity itself.

WITH the success of *Sunray* we add to the MM series of easy to build craft another little packet in the same trend. We have received numerous letters and photos of the completed products from men and boys who had never before attempted the construction of a boat and without exception all of them are very creditable jobs.

Numerous letters were received from timid souls who were afraid to tackle the construction of a craft of *Sunray's* complexion; and as an answer to those letters we are presenting *Tubby*, the ultra-simple little boat here shown.

A cursory examination of the plans will show the simple scow construction with very few pieces requiring a bend (there are only two), and no complicated centerboard to bother with.

The scow type may at a glance seem a boat unsuited for sailing but we only have to point out the Dutch craft famous for their sailing and their ability to set down on the hard at low tide. *Tubby* isn't Dutch by any means, but follows a type of craft fast disappearing from the Chesapeake Bay, which before the advent of the motor truck carried most of the building stone between Port Deposit and points on the bay. Most of them were large sloop rigged craft.

The construction of *Tubby* may be started by getting out the side boards as shown on Plate II. These are made from 12-foot boards, fifteen inches wide, of pine procur-

Outboard Profile and Deck Plan Give Many Details and Dimensions

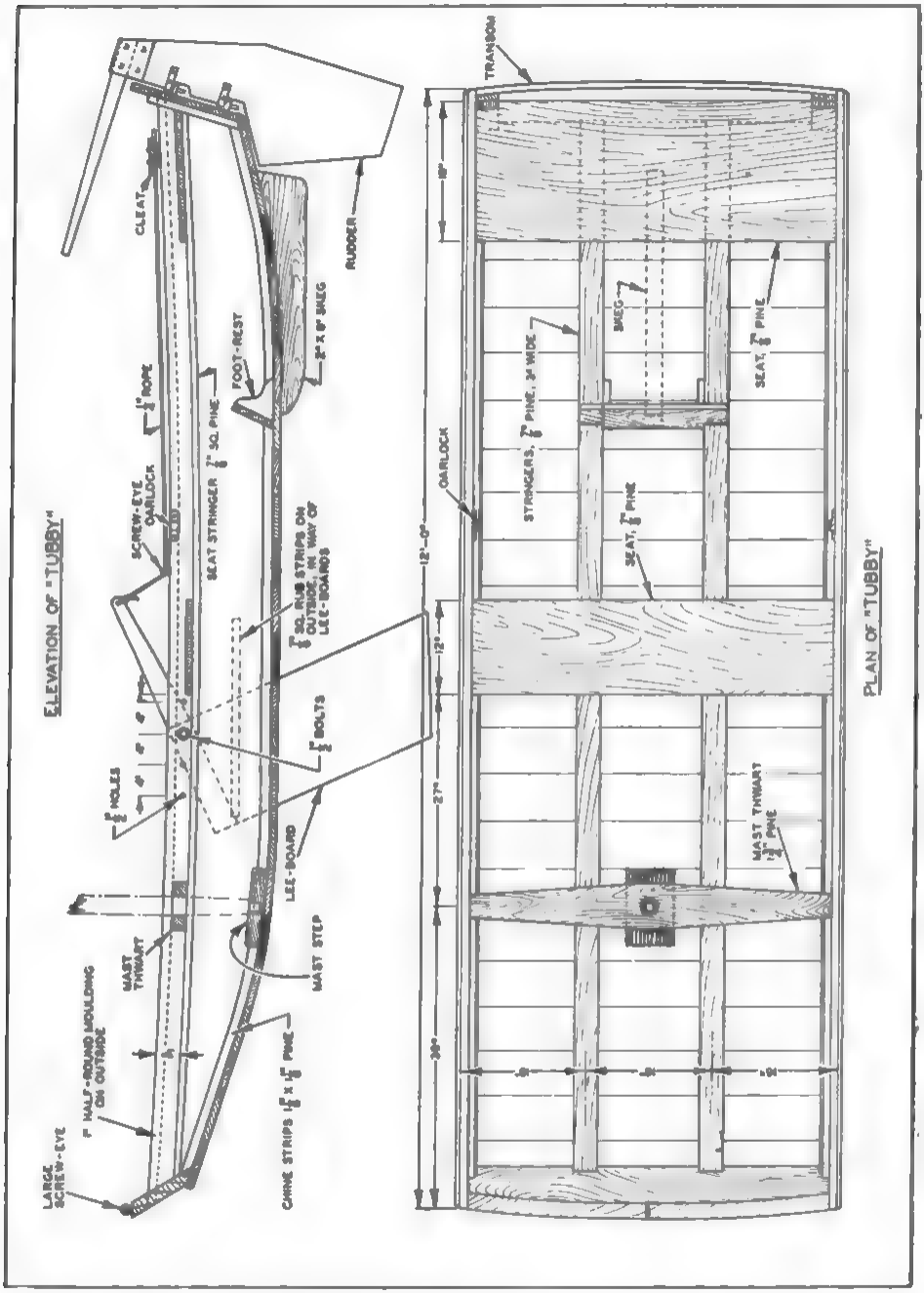


Plate I—This detailed working drawing of the outboard profile and deck plan gives most of the important dimensions. After the sides and ends of the boat are made they are fastened together with paint and flannel in all the joints, and the bottom is nailed or screwed on. The bottom and seat stringers are next fastened in. The leeboards are attached to the side of the hull with ½" bolts, and the rudder is hung over the stern on pintles and gudgeons.

Construction Plate Below Shows All Measurements for Major Pieces

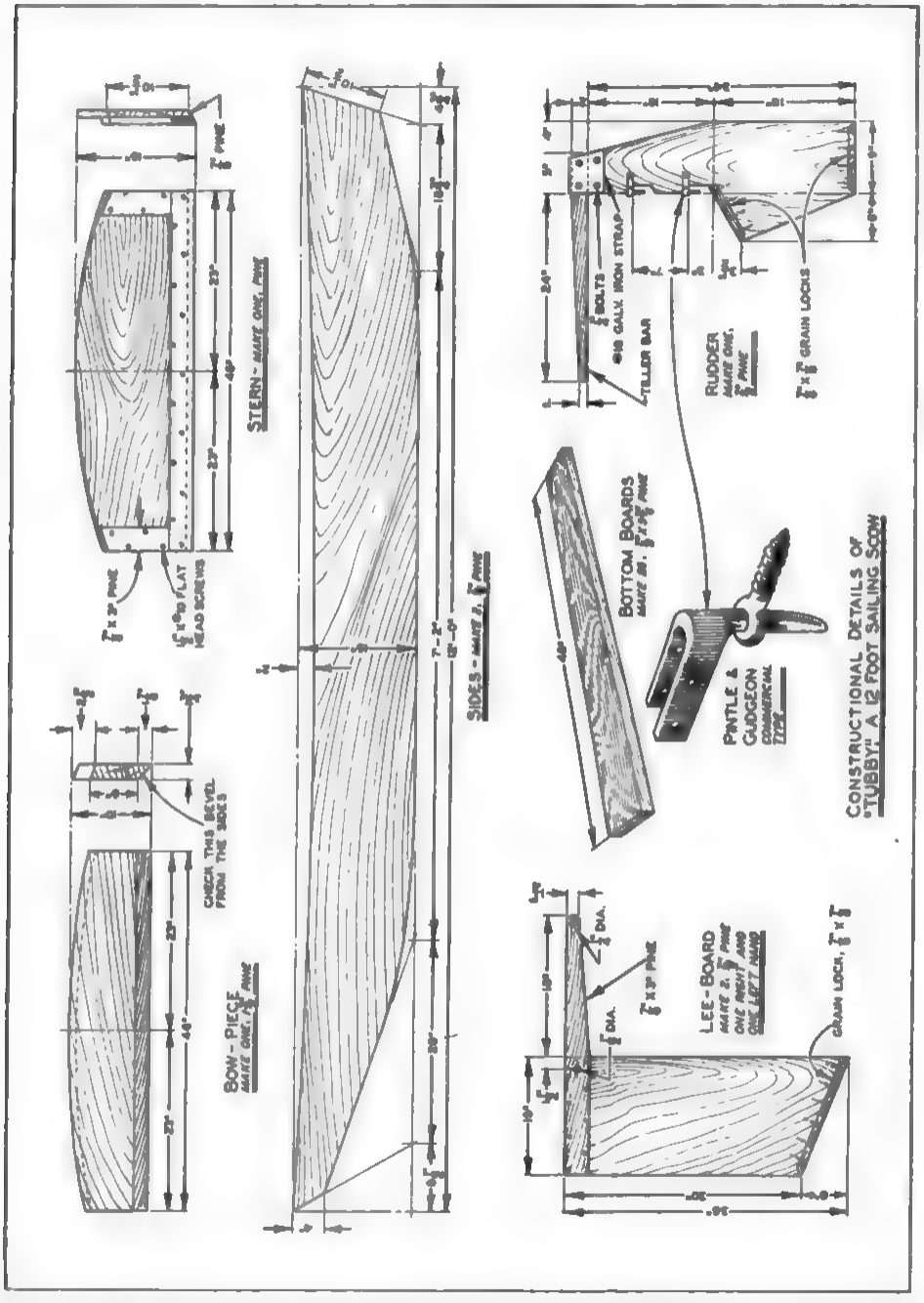


Plate II—The construction is started by cutting the side boards to the dimensions shown here. These are made from 12" boards, 15" wide. If 15" boards are not obtainable a 12" board may be substituted, with a 3" board dowelled on top of it. The bow is made from 2"x10" pine, beveled and shaped as shown on the working drawing. The bottom bevel should be left a trifle full and dressed on the job. The stern is made from a pine board 15" wide, with an edging of pine 3" wide. Joints of surfaces should be thickly smeared with paint—this precaution should be followed throughout.

Diagram Shows Method of Tacking With the Popular Dipping Lug Rig

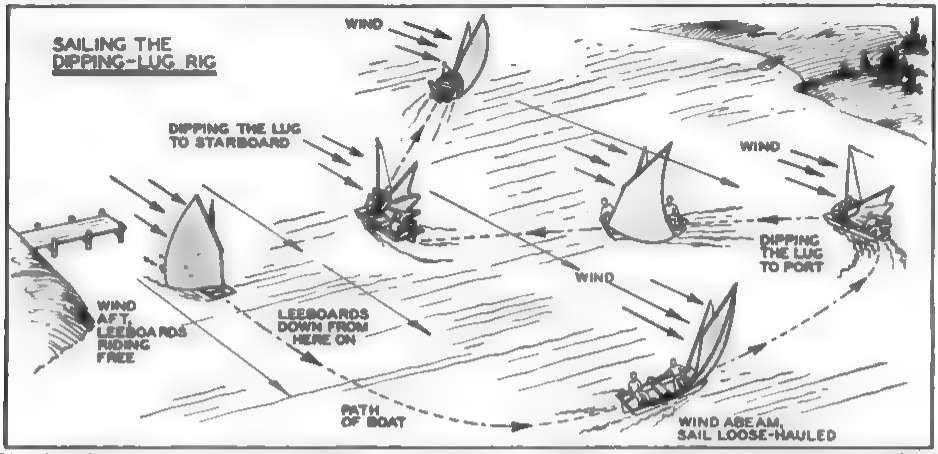


Plate III—This diagram shows how "Tubby" is sailed when the dipping-lug rig is used. Study this drawing carefully.

able at any lumber yard. If 15-inch boards are not obtainable a 12-inch board can be substituted, with a 3-inch board doweled on top of it.

The chines, of 1⅛" square pine are bent around the bottom edge after having been generously doused with scalding hot water at the places where the bend occurs.

The bow is made from 2"x10" pine beveled and shaped as shown. The bottom bevel should be left a little full and dressed on the job.

The stern is made from a pine board 15 inches wide, with an edging of pine 3 inches wide. The joints of the surfaces should be thickly smeared with paint. This precaution against leaks and decay should be observed all over the boat.

After the sides and ends are made they are fastened together with paint and flannel in all the joints, and the bottom is nailed or screwed on as the builder's conscience or pocketbook dictates. The bottom stringers are next fastened in as are also the seat stringers.

The mast thwart of 2"x6" pine, the seats and foot rest will complete the interior decoration scheme, while a piece of 1½" half round moulding on the outside sheer line will complete the outside trim.

Constructing the Leeboards

The leeboards are a simple proposition and should be made in a pair opposite each other. The rudder is equally simple. The leeboards are attached to the sides of the hull with half-inch bolts as will be explained later, and the rudder is hung over the stern on pintles and gudgeons which may be purchased from any marine hardware house; or similar fittings, made from large nails bent to shape and hooking into screw eyes, may be substituted.

Oarlocks may be placed in the sides to enable the boat to be worked in a calm, but as this is to be a sail boat let's start talking about sails.

Two rigs have been designed—both of them single masted and as simple as A B C. The first rig, called a dipping lug, is the favorite for small boats in Europe, while the other, a spreetsail rig, is quite a favorite on the eastern shore of Chesapeake Bay.

As all of the details of the rigs, with dimensions of sails and spars, are shown on the sail plans, we will confine our discussion to the merits and method of rigging the two types.

The dipping lug has only one spar and a mast. The mast is twelve feet long, 2½ inches in diameter at the foot, and 1¾ inches at the head. A pulley is fastened at the head to enable the lug to be dipped as the boat is tacked against the wind.

The Gaff and Lug Sail

The gaff is a spar 8′ 6″ long, with a diameter of 1⅝ inches at its center and 1¼ inches at both ends.

The lug sail is 6′ 3″ on the front edge,

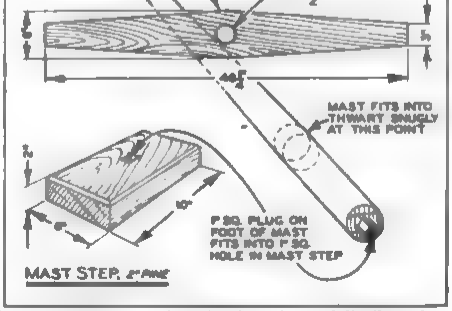


Plate IV—This working drawing shows full dimensions for the mast step and thwart, and also illustrates how the plug on the foot of the mast is cut to fit the mast step.

Complete Sail Dimensions and Rigging Details of the Spreetsail Rig

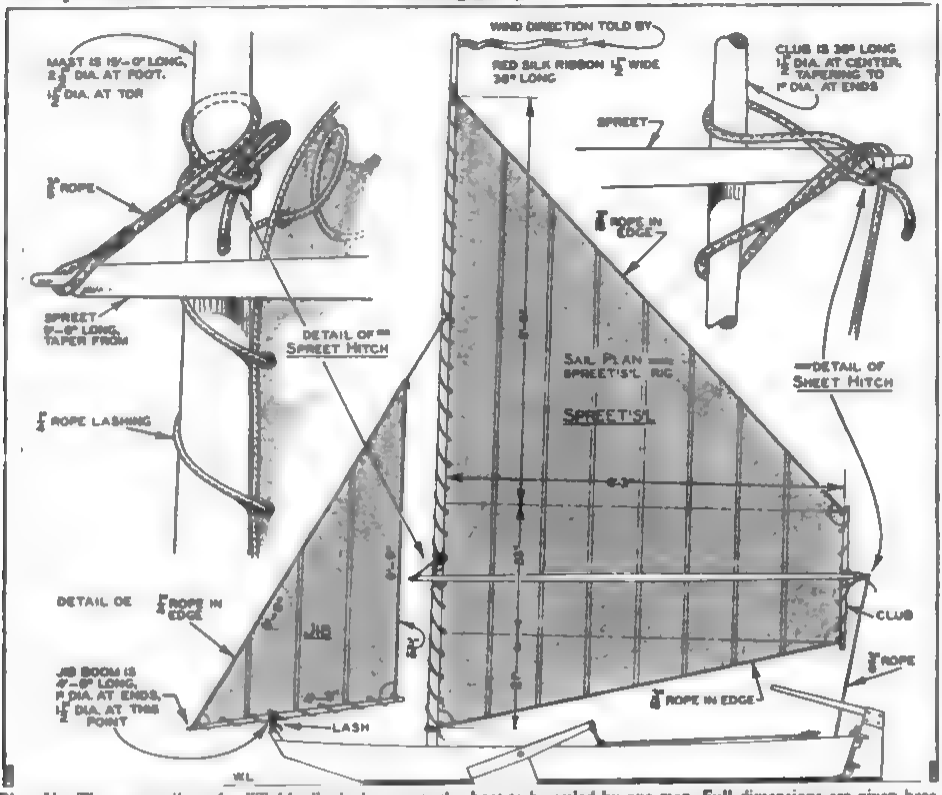


Plate V—The spreetsail rig for "Tubby," which permits the boat to be sailed by one man. Full dimensions are given here.

8′ on the gaff, 12′ on the rear edge, and 11′ on the bottom edge. The distance between the lower point on the gaff and the rear end is ten feet.

The sail may be made from twilled muslin or drill with the edges of the widths sewed together. The sail is first laid out on a large floor and the correct shape marked on the goods. After cutting and hemming the edges a 3/16" diameter rope is sewed around all the edges except the front, where a ¼" diameter rope is fastened. Cotton rope should be used for this purpose and the stitches should go through the rope—not around it. A sail needle and sailors' palm will come in handy for this work.

Brass grommets should be spaced at about ten inch centers along the gaff, or a more primitive method of sewing small iron rings for the lacing may be substituted as shown on Plate VI. A snap hook fastened to the front lower edge will facilitate quick handling.

The spars are of spruce and may be made as shown in the 1932 How To Build It book for *Sunray*, or they may be cut from spruce or pine saplings which are reasonably straight.

In sailing this rig the lee boards are fastened to the side of the hull in the position shown, and the boat started down the wind. The sheet or the rope at the back end of the sail should be let out as much as the sail will allow without doubling up against the mast.

To sail with the wind on the beam the sheet is hauled a little tighter until the sail is well filled, and the lee board on the lee side or the side away from the wind is lowered to prevent the craft from crabbing or

BLUEPRINTS FOR "TUBBY"

A complete set of large size shop blueprints of "Tubby," a 12-foot sailing scow, may be obtained for $1.25, postpaid, from Modern Mechanics and Inventions, 529 So. Seventh Street, Minneapolis, Minn. Blueprints are not sent C.O.D. nor on approval.

Dipping Lug Rig, Popular on Chesapeake Bay, Shown in Detail Below

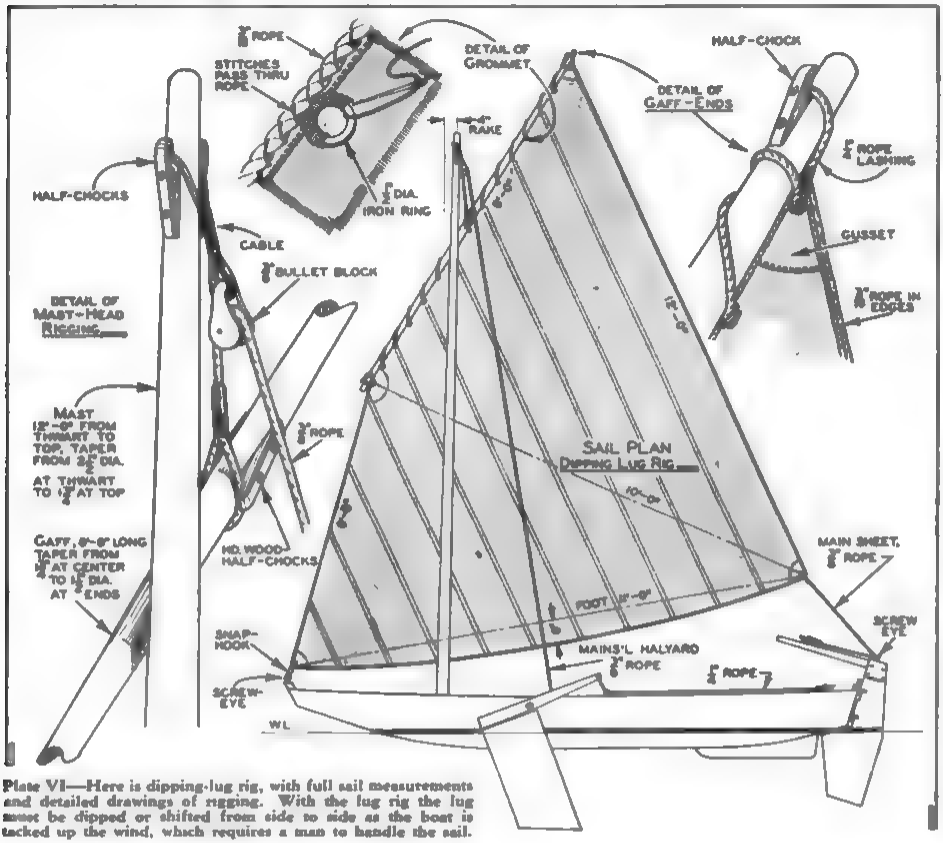


Plate VI—Here is dipping-lug rig, with full sail measurements and detailed drawings of rigging. With the lug rig the lug must be dipped or shifted from side to side as the boat is tacked up the wind, which requires a man to handle the sail.

going sideways across the water. If the boat shows any marked tendency to come up into the wind the lee board should be moved aft, or if it shows a tendency to fall off the board should be moved forward. A series of holes in the side will make this adjustment quite easy.

The spreetsail rig is a nattier looking job, and while more complex in construction is a somewhat easier boat to handle. With the lug rig the lug must be dipped or shifted from side to side as the boat is tacked up the wind, and there is nothing prettier than a smart crew handling a dipping lug rig on the wind. The spreetsail rig, or to pronounce it as they say on the Bay, "spreetsul," with the last syllable pronounced very quickly, may be easily handled by one man, as there are no ropes to change as the boat goes about.

The mast for the spreetsail rig is fifteen feet high, 2½" diameter at the bottom, and 1¾" diameter at the top. The spreet is 9' 6" long. It has a diameter of two inches at the center, 1½" at the front end and 1¼" at the rear. The ends are worked down to a spud about ¾" in diameter for the sail hitches.

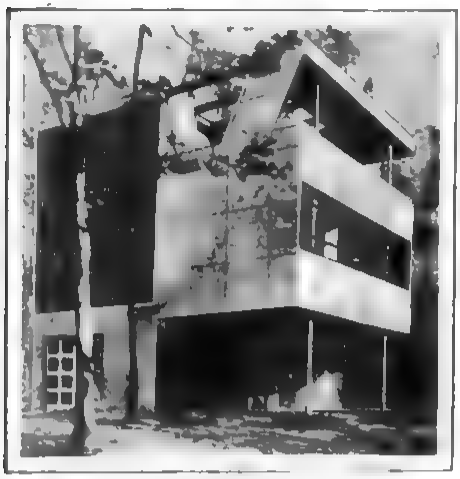
A club three feet long is fitted at the rear end of the sail, which has a diameter of 1¼" inches at the center and one inch at the ends. A jib boom 4' 6" long, with a center diameter of 1½" and end diameters of one inch is made for the foot of the jib. A lashing fastens this boom to a screw eye in the bow of the boat and a small rope fastens the top of the jib to the mast as shown on Plate V.

The sails for the spreet rig are made in the same manner as the lug. The spreet sail measures 14' along the mast and 8' 3" along the spreet. The lower end of the sail at the club is 21 inches above the lowest point of the sail and the length along the club is 33 inches. This leaves a distance of 8' 6" to the top of the sail.

Lacing for either type of sail may be either through small screw eyes spaced along the spars or around and around the spars as shown, which is a much simpler method.

(Continued on page 181)

Latest in Homes Has Skyscraper Frame and Glass Walls



Built mainly of steel and glass, this home has all comforts.

CUBICAL in construction and designed to build for $2500 or less, the model house shown in the photo at the left has just been completed in Syosset, Long Island. It is intended to serve the needs of families whose income is $1800 a year or less.

Simple modernistic lines, with no fancy and expensive curlicues, characterize the design. Steel is used for the framework, giving it the durability of a skyscraper skeleton. Much glass is used to admit plenty of light.

A garage is on the first floor, with laundry rooms adjoining, and a porch alongside, open to the outdoors. The second floor has a living room, dining room, kitchenette, and one bed room. The third floor has two bed rooms and a closet, in addition to a large sunny terrace open to the sky for the children's playground.

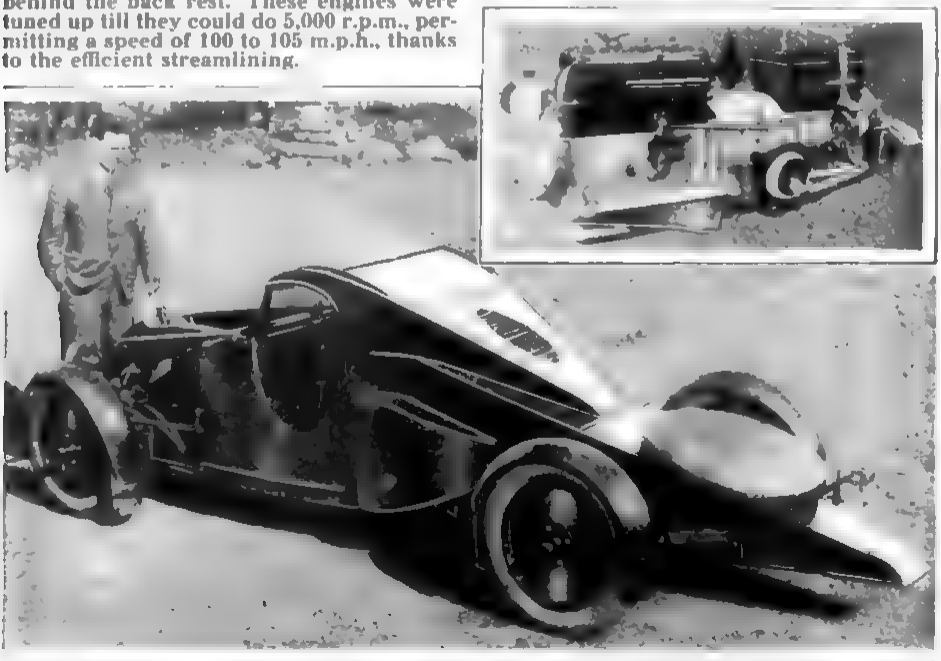
A small furnace for heating is also installed at the rear of the garage, and practically all the usual home conveniences are provided at a minimum of expense and slight costs of repair and upkeep.

105 M.P.H. Streamlined Auto Built in Home Workshop, Uses Ford Parts

EXTREMELY unique in design, but highly serviceable withal, is a new home-built auto which an English mechanic recently completed after five years of labor in his workshop.

Power is obtained from two Austin 7 h.p. engines placed transversely in the frame behind the back rest. These engines were tuned up till they could do 5,000 r.p.m., permitting a speed of 100 to 105 m.p.h., thanks to the efficient streamlining.

Instead of the conventional chassis the car is built around a frame made up of angle steel and welded joints. Of all the parts used in construction, the only ones which were purchased were the bevel gears to convert the drive from transverse to fore and aft. Many Ford parts were utilized.



A product of home workshop, this streamlined auto does 105 m.p.h., powered by two Austin engines, set transversewise.

Scientific Daredevils Thrill Circus Crowds

These performers at Madison Square Garden know all about gravity—they know, too, just how to keep it under control with the shafts of their balancing poles.

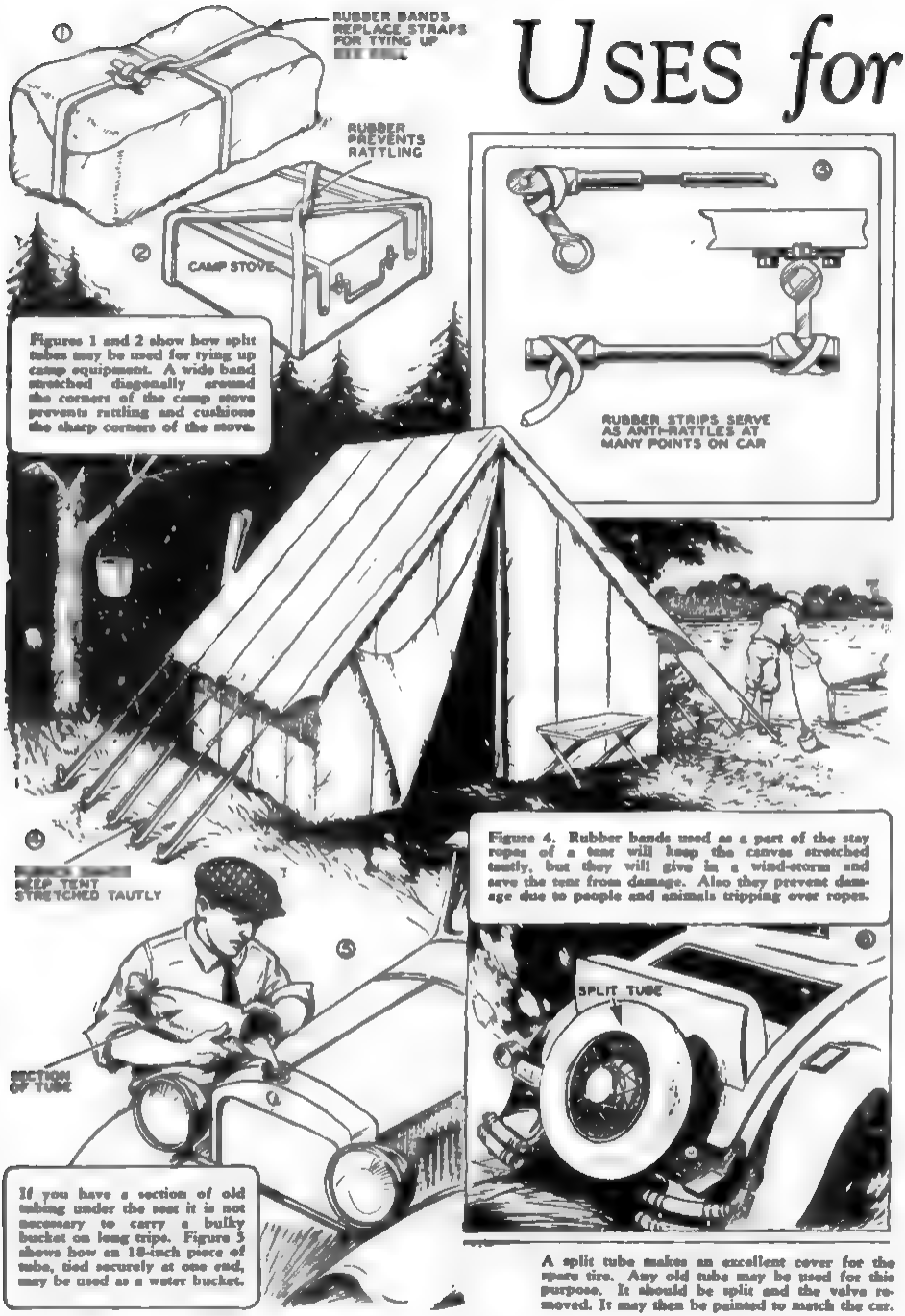
Stilt walking looks easy—but try it once if you want a demonstration of Newton's laws of motion.

Bee Kyle, who dives from a 100-foot ladder into six feet of water, knows why she must strike at exactly the right angle.

Inertia and centrifugal force are the elements this acrobat counts on to make his loop-the-loop at 60 m.p.h. successful.

STUDY the photos above—then stop and realize that every one of these performers is a living demonstration of natural laws of physics, bringing science to the service of the god of entertainment. Nerve is a prime requisite of daredevils like these, but a keen brain capable of analyzing physical laws is even more necessary.

USES for



Figures 1 and 2 show how split tubes may be used for tying up camp equipment. A wide band stretched diagonally around the corners of the camp stove prevents rattling and cushions the sharp corners of the stove.

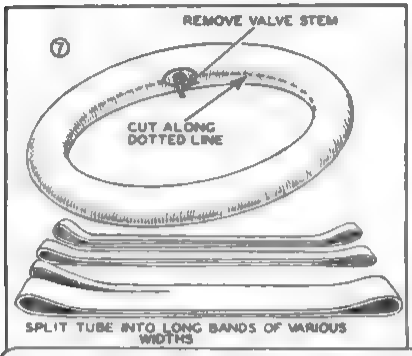
Figure 4. Rubber bands used as a part of the stay ropes of a tent will keep the canvas stretched tautly, but they will give in a wind-storm and save the tent from damage. Also they prevent damage due to people and animals tripping over ropes.

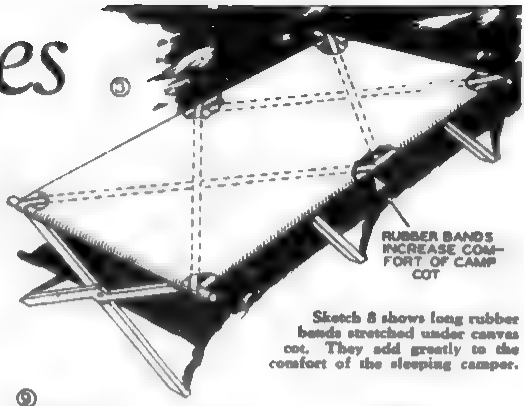
If you have a section of old tubing under the seat it is not necessary to carry a bulky bucket on long trips. Figure 5 shows how an 18-inch piece of tube, tied securely at one end, may be used as a water bucket.

A split tube makes an excellent cover for the spare tire. Any old tube may be used for this purpose. It should be split and the valve removed. It may then be painted to match the car.

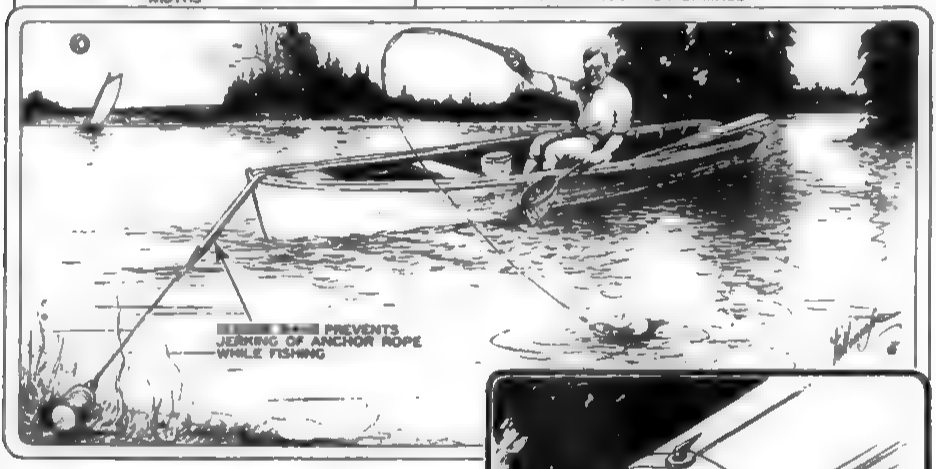
Not infrequently, on an extended trip, you may be compelled to drive for some distance on freshly "metalled" road surface. Crushed rock, direct from the crusher, has very sharp edges, and your tires may receive many small cuts, which ultimately will cause trouble and shorten the life of the tire by many hundreds—maybe thousands—of miles. To guard against this, a set of split tubes should be stretched over the tires. Let the tubes take the brunt of the wear. Tube rubber is far more resilient than the tire tread rubber and is difficult to cut except with a very sharp instrument.

Old Tubes





Sketch 8 shows long rubber bands stretched under canvas cot. They add greatly to the comfort of the sleeping camper.



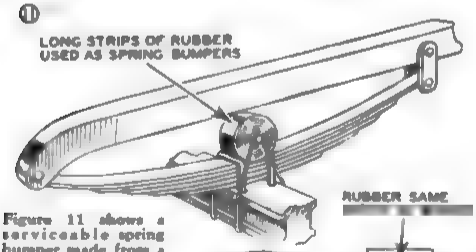
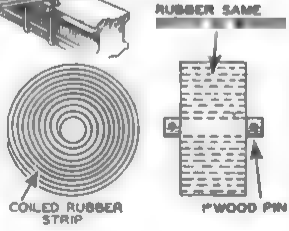


Figure 11 shows a serviceable spring bumper made from a long strip of rubber. The strip should be the same width as the spring-leaf and should be coiled over the cylindrical wooden core. The coil is held by one or more endless bands cut laterally from old inner tube.



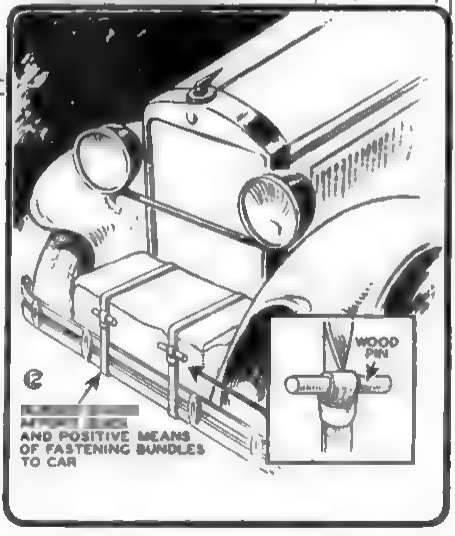


Figure 7, at the top of the page, illustrates how the long rubber bands are obtained from old tubes. Such bands may be used as a quick and positive means of securing bundles to a car. Unlike straps or rope, the bands draw and hold more snugly with the jarring and vibration of the car. A simple wooden pin, as shown in the inset on figure 12, serves as a positive fastener, as the rubber will always be taut. Undoubtedly many additional uses will come to your mind.

A real airplane, m'lads, and it gets its power from the innards of a Model T Ford. This ship is just as sturdy as it looks, is easy to build, and can take off and land at a field which would stump an OX-5 or like-powered job.

PLANS *for the* *Pietenpol* SKY SCOUT

by **B. H. PIETENPOL**

Designer of the Pietenpol Air Camper

Modern Mechanics and Inventions is again first in the light plane field. This month we give you the second installment of the little sister to the popular Pietenpol Air Camper. The one-place Sky Scout is powered with a Model T Ford engine and can be built for less than $400.

PART II

YOU fellows who have been demanding a real airplane powered by a Model T Ford engine have no doubt digested last month's installment, in which we discussed what could be expected of the ship, and in which you were given part of the plans and instructions for building.

In the first installment, you will remember, we took up the building of the fuselage and wings. Now we will go on from there. This month's installment will include the tail assembly, landing gear, and controls.

The Landing Gear

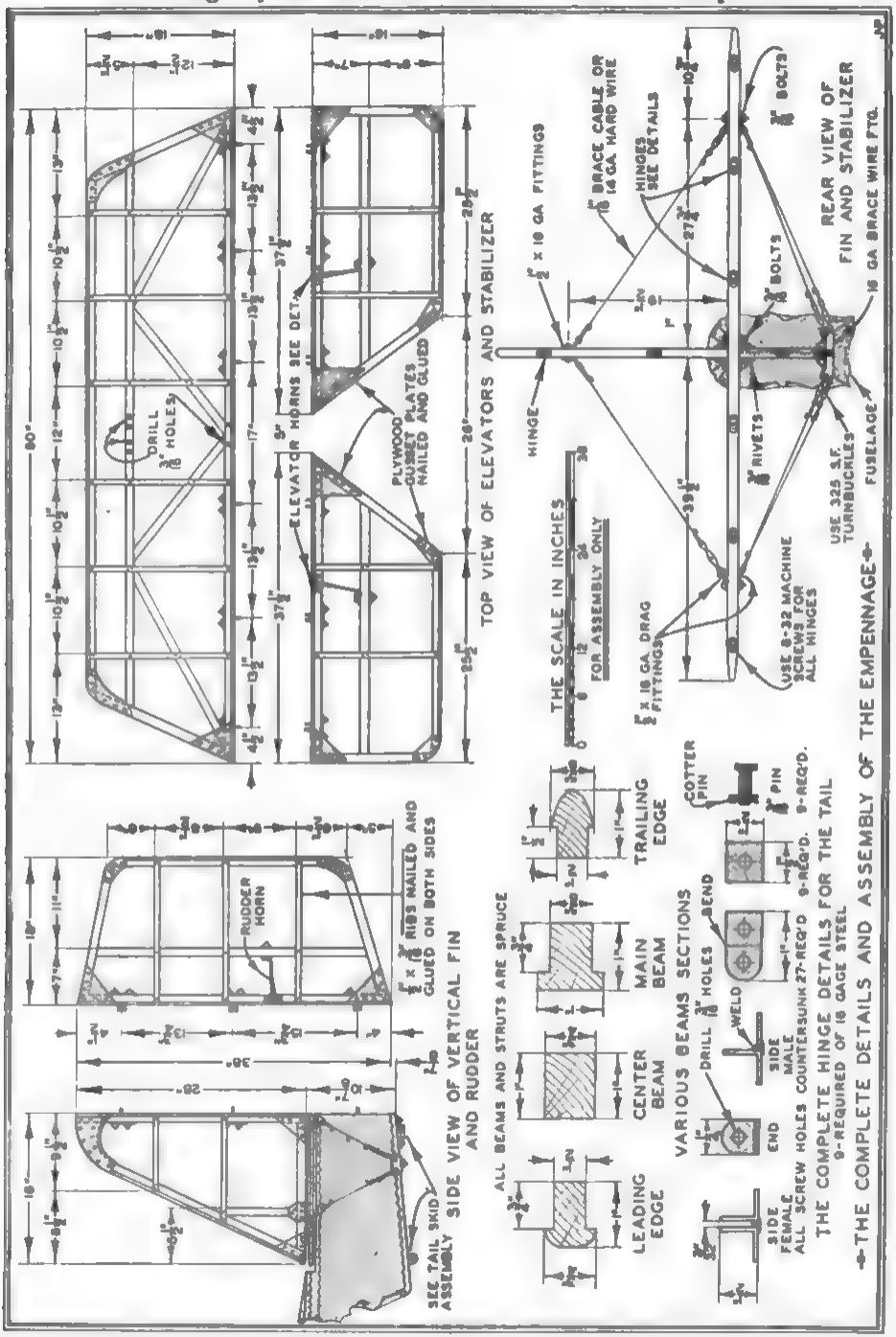
We will first take up the landing gear. This has proven to be a very strong outfit which will stand plenty of abuse. While it would be difficult to explain how this is built, the plans are very clear and you should have no trouble.

You will have to use a turning lathe and be a good welder to make the gear shown here. You may also build the type of landing gear that is used on the Air Camper. You will find that this is much easier to make and is quite strong enough.

While we are on the subject of this gear we had better put on some safety device to keep the ship from dropping to the ground if the shock cord breaks, since it seems that everybody has trouble wrapping shock cord.

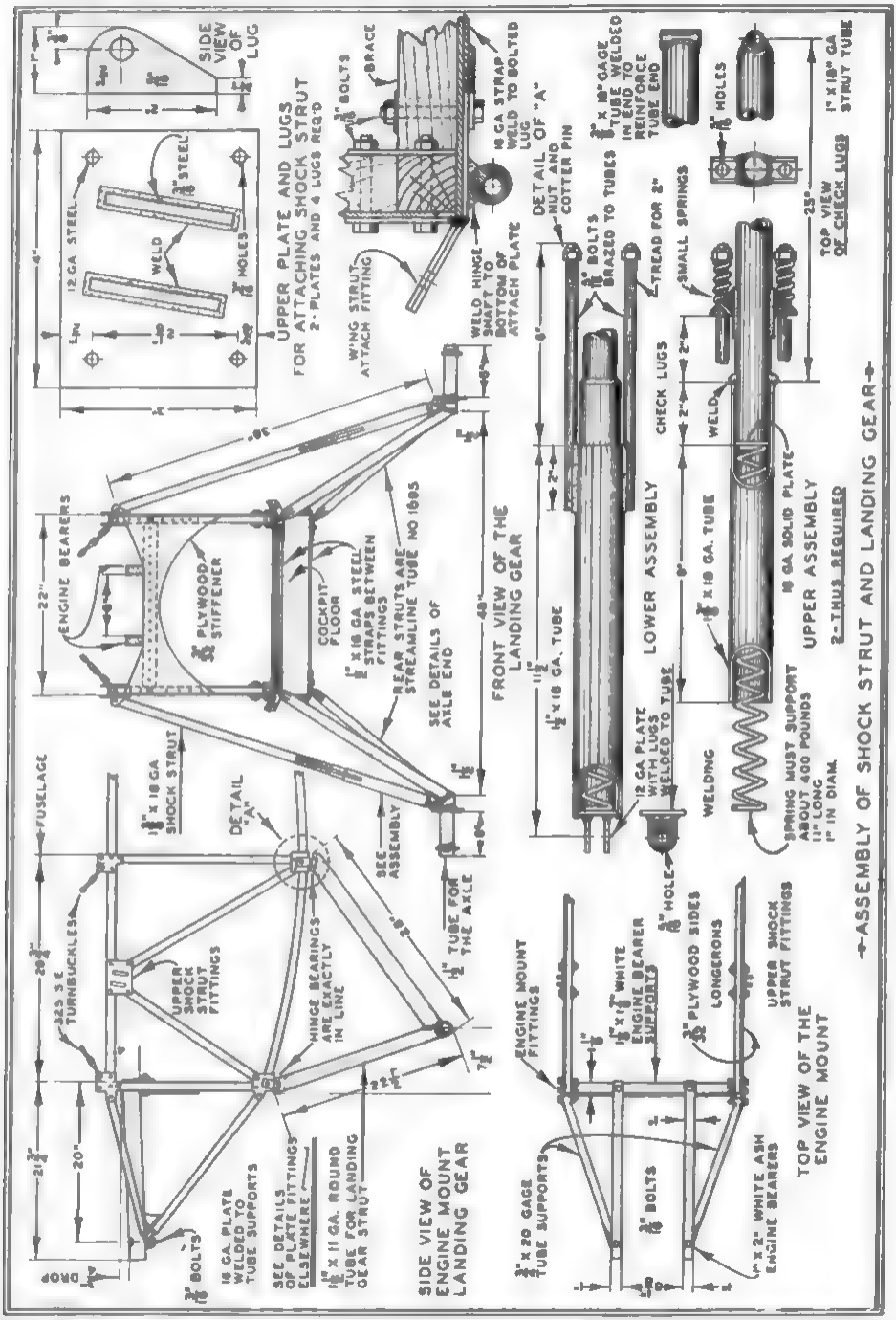
Here is the method we use: First cut a piece of leather to fit around bottom of landing gear vee, and lace it on with lace leather. Now take 6 feet of ½-inch shock

Detailed Drawings of Stabilizer and Elevator Show Simple Elements



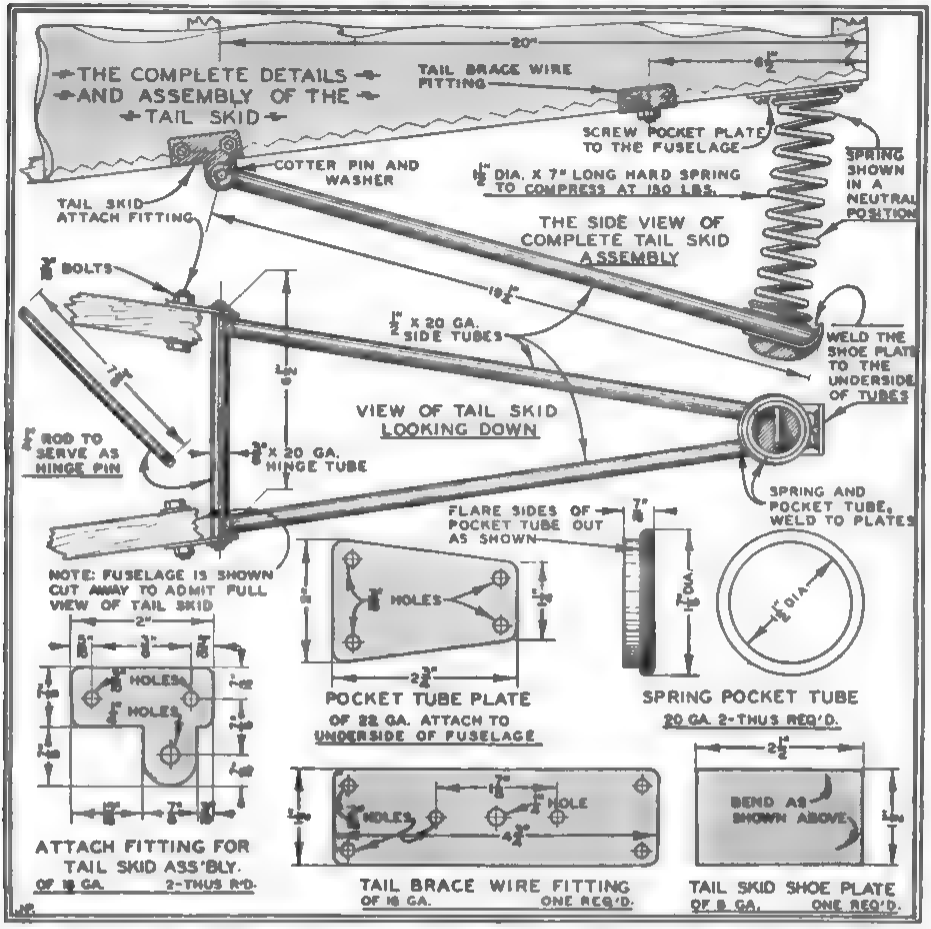
Here are the working drawings for building and rigging the tail assembly of the Sky Scout. This is of simple wood construction, and no plans have been drawn for a steel tube job. The scale applies only to the assembly drawing.

Landing Gear, Shock Struts, and Motor Mount Are Shown in Detail



This working drawing shows the extremely rugged split-type landing gear designed especially for the Sky Scout. At the left will be found the dimensions for the bolted steel and ash motor mount. Further details found elsewhere.

Simple Tail Skid Requires A Shoe-Keel to Insure Easy Steering



Complete details for the tail skid are given here. Be sure to weld the keel onto the underside of the skid-shoe.

cord and have some one hold it about half way up on the outside of the front landing gear strut. Take the other end and pass it under the landing gear vee, over the axle, under the landing gear, over the axle, under the vee on the inside of the first wrap, over the axle on the outside of the first wrap and under the vee on the inside of last wrap until you have three wraps pulled quite tight.

The cord should be just long enough to make a good square knot and to permit taping of the ends. This method makes each wrap about the same length and you will not have any trouble with your shock cord cutting. The landing gear should give not over one inch with a full load in the ship, but neither should it be any tighter.

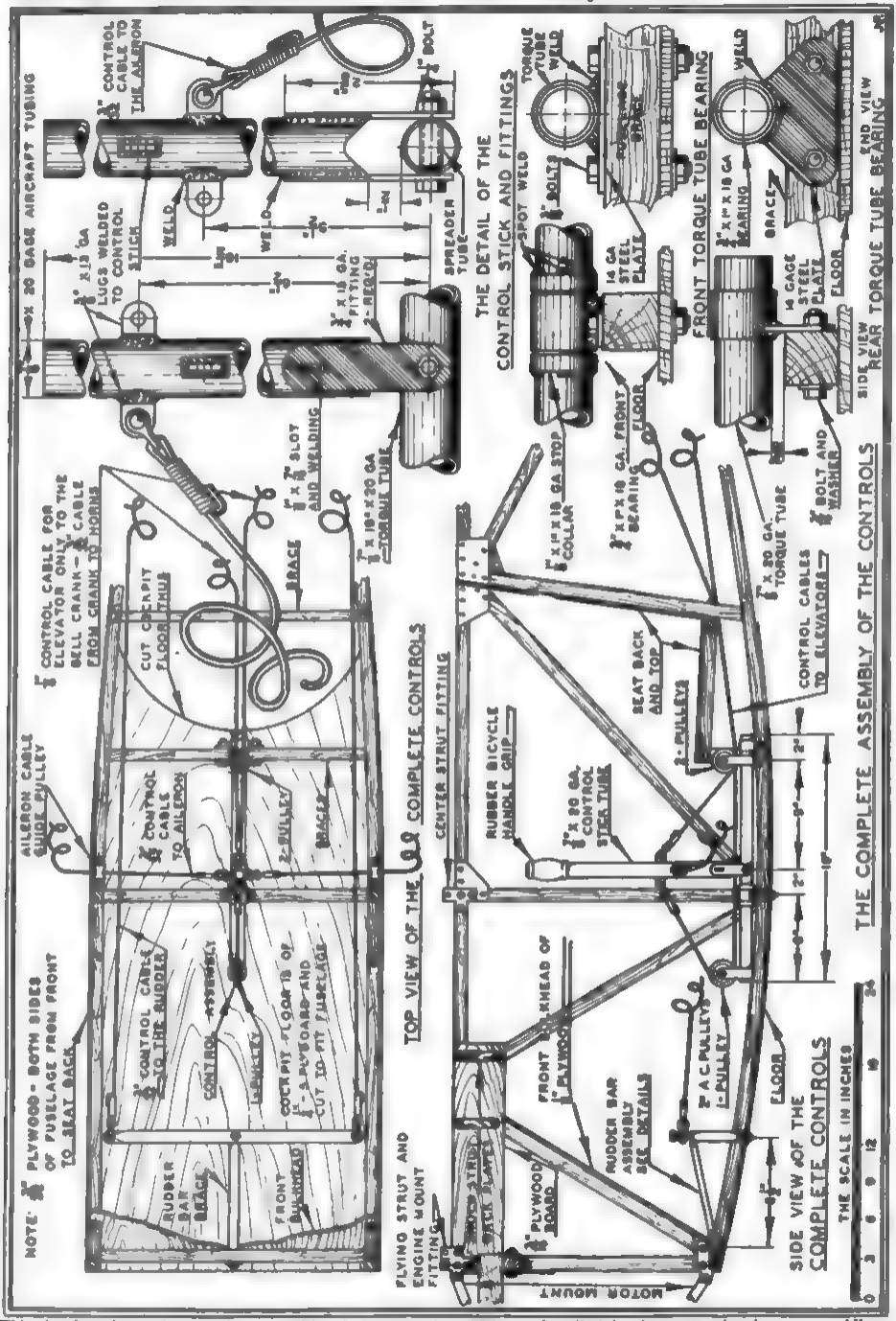
The Tail Skid

The tail skid comes next. This is of extremely simple construction, but it has proved so efficient that we are now using it on all of the planes we build. Be sure to put a small keel on the shoe or you will find

BLUEPRINTS FOR THE PIETENPOL SKY SCOUT

A complete set of large size shop blueprints of the Pietenpol Sky Scout may be obtained for $4.00, postpaid, from Modern Mechanics and Inventions, 529 So. Seventh St., Minneapolis, Minn. Blueprints are not sent C.O.D., nor on approval.

This Plate Gives Dimensions and Details of the Control Assembly



This drawing shows the complete assembly of the controls, which are installed in the conventional manner. Aileron, elevator, and rudder horns and other details will be found on the smaller working drawings. If you are not an expert at welding, this work should be sent out, as failure of the controls has an annoying inclination to become embarrassing.

your ship hard to steer on a windy day. This keel will also help to prevent the beginner from ground looping.

The Empennage

And now for the empennage. If you saw the plans of the Air Camper you will see at a glance that the tail surfaces of the Sky Scout follow the same general lines as those of its big sister. I have, however, cut down the weight a little at this point and I also believe I have given the Scout a bit the best of it on the lines.

But outside of a bit of cleaning up I have seen no reason for changing this part of the ship, as the assembly on both jobs has given quick and sensitive control of the ship at all times. And another thing which is even more important—if you follow these plans you need have no fear of any structural weakness in this most vital part of the ship.

The Motor Mount

In the motor mount you will notice that there is a drop of about one inch on the front of motor mounting. I have had a lot of so-called experts tell me that this should not be. However, I reason that the motor should pull in the direction of travel and not the way the ship points.

We built one ship using a straight motor bed and the climb was not so good, while it was almost impossible to fly it hands off, except at one speed and throttle setting; so my advice is to be sure and give this drop on the front of the motor.

The motor mounting itself is well shown on the drawings and wish to say it is all built right on the fuselage.

The motor bed pieces are bolted on and temporarily braced and then the motor support tubes are fitted to the fittings and bearers.

The Covering

Now put in the gas tank (5½ gal.) and the wing is ready to cover. You may use any light grade of aircraft cloth for this or you may use sheeting. Tack a piece 60 inches wide the full length of the wing all

Rear Admiral Don Finke shows the tail skid and rear assembly. This plane is light enough for the average man to wheel in and out of the hangar without assistance.

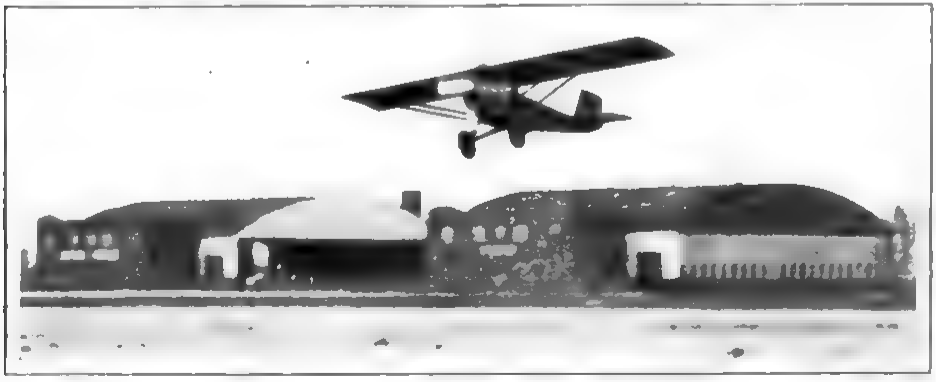
around the edge, bottom side first. Give the edge a coat of dope, turn the wing over and do the same on top.

Now sew the cloth to the ribs in the regular manner, put on a coat of dope, then all the tape and patches around fittings and give the wing four extra coats of dope (5 in all).

The last two coats may be colored. I advise a light coat of paint on the wing if you wish the cloth to last a long time, altho this makes the ship harder to patch.

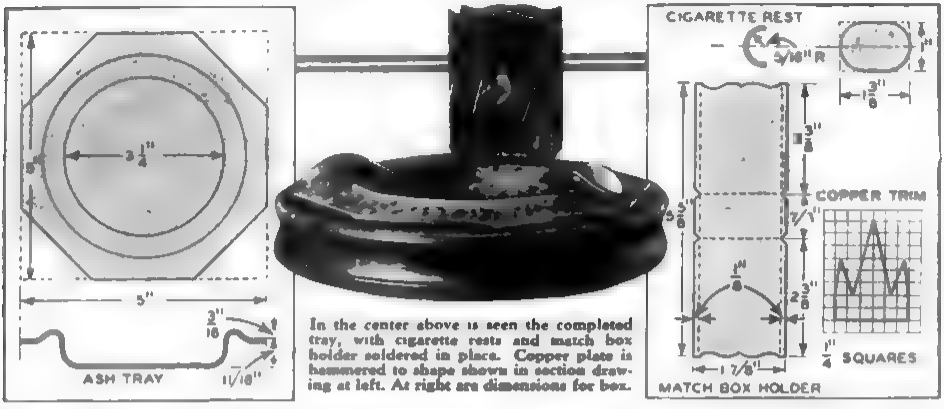
Just a little warning, be sure and put the flap in the center. A lot of those building the Air Camper did not do this but put a large opening instead and spoiled the climb of the ship. Remember that you cannot have all the features of a high powered plane in a small Ford powered ship and expect it to fly well. And the flap is one

(Continued on page 182)



Up she goes! Don Finke taking off at the Wold-Chamberlain airport for a cross country hop. It's easy with the Scout.

Unique Smoking Tray in Hammered Brass



In the center above is seen the completed tray, with cigarette rests and match box holder soldered in place. Copper plate is hammered to shape shown in section drawing at left. At right are dimensions for box.

MANY followers of the sport of "Making Things at Home" have never tried adventuring in metal craft. The smoking tray described below is something that any amateur can build with very few extra tools and it is one which the owner will be proud to show to his friends. This tray can be built with only one extra tool from those that are usually available in the workshop.

The material used is all flat sheet brass and copper. The tools needed are: A rule for measuring, a short piece of round rod, a ball pein or else a raising hammer, a vise, and a soldering iron.

Tray Cut from 16 Gauge Brass

The tray is cut from sixteen gauge brass and is five inches square. A forming mold is prepared by cutting a depression the shape of the tray in the end of a hardwood block such as a billet of stove wood.

This can be made more uniform on the lathe if one is available. After the block is ready, the brass is laid on this and hammering is started in the center. The round end of a small ball pein hammer is suitable for this part if a regular raising hammer is not available.

As the metal is hammered it is stretched down into the mold and at the same time it becomes hard and must be annealed. This is done by heating it red hot over a gas flame or blow torch and then plunging it into cold water.

Tray Shaped by Hammering

The hammering should progress in a circle and gradually work out until the metal has been shaped to fit the mold. After the center has been shaped the rim is hammered down, then it is ready for trimming to the octagon shape by cutting off the corners.

Since the tray was formed by stretching the center of the sheet, the outside dimension will be the same as it was at the start.

The cigar rests are made next. They are cut to shape from twenty-two gauge brass and formed around a steel rod of the proper diameter.

After they are done, they are attached to the rim of the tray with a drop of solder. This is most easily done by holding them in position with a piece of rod. The flame of the torch is held on them until the solder melts. Pressure on the rod forces them down on the rim where they are held until the solder "freezes."

The match box holder is cut in one long strip and the bends are easily made in a vise having steel jaws. After it has been shaped, the copper trim is cut out and coated with solder on the back.

Trim Soldered to Tray

A drop of solder is placed under each piece and heat is applied until the solder melts; then they are pressed down firmly against the brass, and held until the solder is cool. After the trim has been applied the hammering on the box holder is done.

If the hammer is too large the pounding may be done with a small, round end punch made of drill rod. The drill rod, when used on the metal, will give the same hammered effect on small surfaces that a hammer does on large pieces.

The box holder is assembled and bolted to the rim of the tray with a short bolt; the piece is then ready for cleaning and polishing.

Clean Metal With Sulphuric Acid

The best method of cleaning is boiling it in a solution of sulphuric acid. This will take off all oxide and leave the bright metal when buffed and it can be coated with a thin wash coat of shellac or lacquer to prevent tarnish.

The piece may also be buffed without the acid cleaning. This will polish the high parts and leave the rest dark from the oxide and gives a very pleasing contrast in the finish. When this finish is used it must also be coated to prevent tarnish on the polished parts.

Amateur Electrician

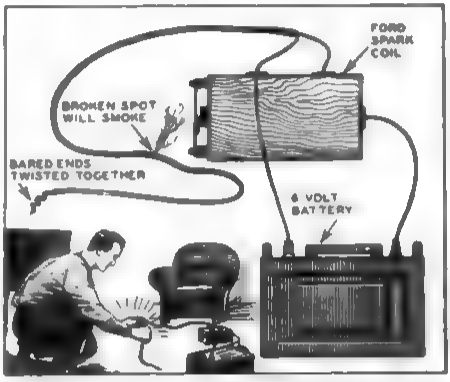
Edited by SEWELL LEHMAN

Ford Coil Finds Break in Long Cord

WHEN a lamp cord becomes snarled or kinked it often causes a break in the insulation and thence proceeds to wreak havoc in the fuse box. To locate the point of shorting in the cord is not always easy because of the insulation covering, but if you have a Ford coil and a six-volt battery you can make short work of the short circuit.

Take off the cord and twist the two bared ends of the wire together. Then clean off the other two ends and attach them to two high-tension contacts of a Ford coil, as shown in the drawing. Next wire up the coil to the battery in the usual manner.

When the juice is turned on a high-voltage current runs through the wires. Because the ends of the wires are twisted together the current will eventually jump the gap, generating heat so that you can quickly see the smoke issuing from the point of breakage.



Juice from coil heats up defective point as shown above.

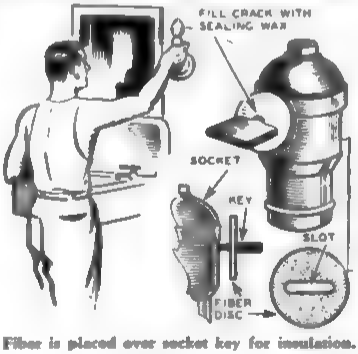
Drawing shows where the notch is filed.

Notched Scissors Make Handy Wire Cutters

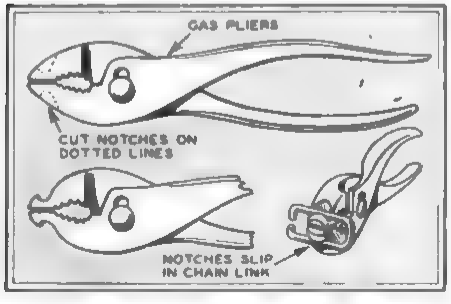
AN OLD pair of scissors may be adapted to cut copper wire as heavy as No. 16 gauge quite easily by simply grinding or filing a notch of the proper shape in one of the blades at the point shown in the accompanying drawing. The notch can best be ground on the edge of a small emery wheel or cut by a three-cornered file and beveled at an angle about equal to that of the original cutting edge of the blade.

Fibre Disc Prevents Shocks

BATHROOM electric fixtures are sometimes responsible for serious shocks. Adequate insulation can prevent these calamities. The most common fixture is the key socket, and this can be rendered harmless by affixing a small fiber washer to the key as shown in the drawing at the right.



Fiber is placed over socket key for insulation.



Link is easily opened by pulling handles of pliers apart.

Open Chain Links With Gas Pliers

ELECTRICIANS working with drop lights in which chain suspension is used know what a tedious job it is to open the links when the chain has to be shortened. A pair of gas pliers, notched on the outer side of the jaws make a serviceable tool that opens a link in short order. The notch is filed to about the depth shown in the drawing, so that the jaws will fit snugly in place. To open the link simply pull out on the handles.

Simple Electromagnet

Fig. 1. When current is turned on to the electromagnet the bulb glows as if it had a regular connection. The coil under the base is soaked in paraffin to prevent short circuiting.

Fig. 2. Here is the completed electromagnet, set atop its mounting, with core inserted. With 110-volt current on, it is ready to perform a number of amusing stunts.

THE well-known barrel of monkeys could produce no more entertainment than an electromagnetic "circus," consisting of a powerful solenoid magnet and a number of accessories, that you can construct in an evening.

And besides being a source of fun, such a device is highly instructive, and will serve to clear up many of the mysteries of everyday electricity for you.

The electromagnet or solenoid consists of nothing more than a quantity of insulated wire wound on a spool, and provided with a suitable base, connecting wire and plug.

You can obtain a large wood spool from almost any electric shop that does motor repairing; or perhaps the wire you purchase for the magnet will be on a suitable spool. The one illustrated herewith measures approximately 3¾ in. long and 3½ in. across the ends.

Winding the Electromagnet

The amount of wire you can use varies within considerable limits. About 3 lbs. of No. 22 enameled, cotton-covered magnet wire will do; or you can use 7 lbs. of No. 20, or 15 lbs. of No. 18 wire.

The larger the wire, the less quickly will the coil overheat. If you have access to a screw-cutting lathe or a coil-winding machine, you can do a neat job, putting the wire on in even layers, with a thickness of oiled cloth tape or other insulating material between layers, as shown in Fig. 6.

You can do an equally satisfactory job by hand. A few inches of each end of the

Does Mystifying Stunts

Fig. 3. The wire spring wrapped around the core, which is made of ½-inch steel shafting, dances up and down creating striking display of pyrotechnics. Flashlight bulb wired to coil will glow mysteriously from induced current.

Fig. 4. Electric cord is run through bushing set in box and wired to carbon connectors, to which are also hooked leads from the electromagnet.

wire should project through holes in one end of the spool.

Mount the coil in a vertical position, on a hollow wood base so that a core can be moved up and down through the hole in the spool. The base illustrated in Fig. 5 has sloping sides, and measures 5 in. high, 5¼ in. square at the bottom and 4 in. square at the top.

The spool is attached to it by means of two small bolts passing through holes drilled in the end that has the coil wires projecting from it. Also, there is a large hole in the center of the base, corresponding to that in the spool.

Wiring Up the Magnet

The flexible electric cord to which the coil terminals are attached enters the base through a hole in one side, and is kept from slipping out by a knot tied near the end.

The best core consists of a bundle of soft iron wires held together by a wrapping of cloth, cord or other binder. The core should be of such size that it can be moved up and down in the spool hole, yet will remain in any position.

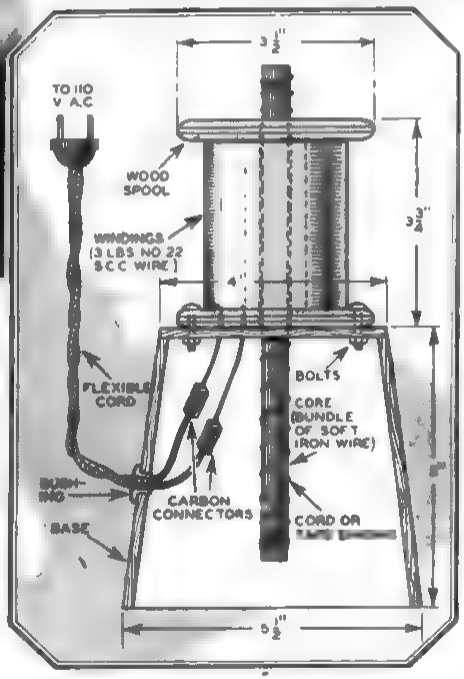


Fig. 5. Drawing shows complete assembly of the magnet and mounting. Spool is secured to box with bolts, while core comes flush with top. Loop cord inside to prevent loosening.

It should be of such length that, when the lower end is resting on the table or other surface supporting the coil base, the top end will be flush with the upper end of the spool.

In the model illustrated, this calls for a core 8¾ in. long. Instead of a bundle of

Magnet Makes Ring Fly Off Core—Heats Up Copper Plate Like Stove

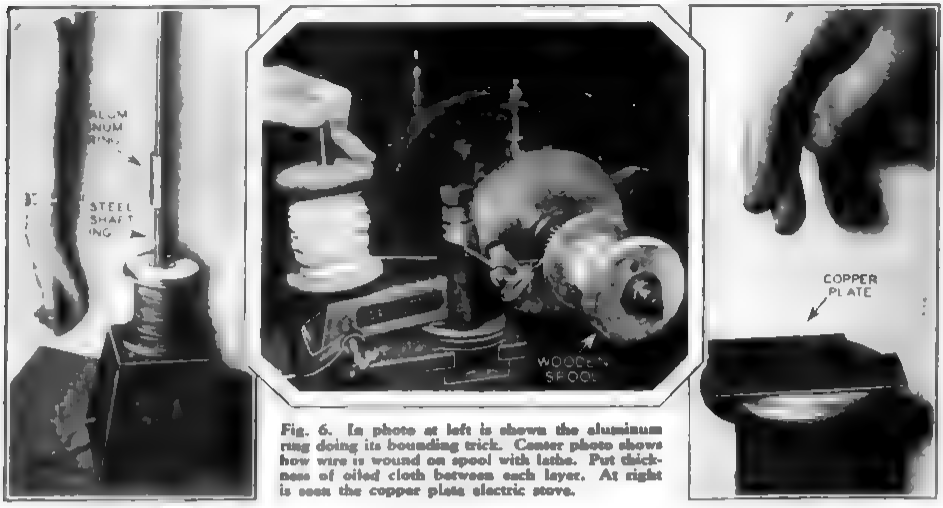


Fig. 6. In photo at left is shown the aluminum ring doing its bounding trick. Center photo shows how wire is wound on spool with lathe. Put thickness of oiled cloth between each layer. At right is seen the copper plate electric stove.

iron wire, you can use a length of ½-in. steel shafting, as shown in Figs. 3 and 6, with almost equal results.

You can operate the coil directly from the 110-volt, alternating current house-supply line; or, if you find that it overheats rapidly, you can interpose a resistance in series with one of the leads. An electric heater element, suitably protected by a guard of some kind, will serve. A number of direct-current experiments also can be performed, using a 6-volt storage battery as a source of power.

Tricks You Can Do With the Coil

Now for some tricks with the coil, using 110-volt A.C. current:

The jumping ring is a spectacular and amusing performer. Adjust the core so that two-thirds of it projects above the coil, or insert the 2-ft. length of shafting into the hole. Drop over it an aluminum ring—a section of ¾-in. aluminum tubing an inch or two long will do, as illustrated in Fig. 6.

Turn on the current. The ring will jump up the core and, if it does not fly clear of the core, will bounce up and down in a swing-like manner, finally coming to rest at a point some distance up the core from the coil.

The height attained depends on the weight. A copper ring, consisting of a single loop of copper wire with the ends connected, will do the same thing, but will not climb as high because of its greater weight.

The Jumping Ring Trick

Now, with the coil current turned on, grasp the aluminum ring in your fingers and hold it down against the coil end. Soon the metal will become warm, and you may find it necessary to let go of it. The energy with which the magnetic force is trying to push the ring away is converted into heat.

With the core end flush with the coil top, lay over it a thick piece of sheet copper as shown in Fig. 6. Turn on the current, and in a short time the copper will become so hot that water, when dropped on it, will sizzle away into steam. It is even possible to fry an egg on this improvised "stove."

This leads to another interesting stunt. Make a coil by winding, around a bottle or other cylinder an inch in diameter, of 30 to 50 turns of No. 26 insulated magnet wire. Remove the coil from the form, bind it with cord so that it forms a ring, and connect the ends to the terminals of a miniature socket that accommodates a flashlight bulb.

Test the arrangement by bringing the coil near the top of the electromagnet, when the core is all the way down. The lamp should light. If it is too bright, remove some turns from the coil; if too dim, add more.

Secret of the Flashlight Bulb

With the coil held snugly against the socket, and the bulb in place, dip the wire and base into melted paraffin, covering everything but the glass bulb. Now, if the paraffined coil is placed in a glass tumbler or beaker of water, and the container is set on top of the electromagnet, the lamp will light, in a manner mystifying to the uninitiated.

Another trick involves a dancing coil. Make a "spring" of fairly fine copper or aluminum wire by winding a dozen turns around a form, and arranging the ends so that they touch each other lightly. Drop the coil over the projecting core of the electromagnet, with the current turned on. The coil will dance about in a startling manner, with sparks flying from the ends, if everything has been adjusted properly.

You doubtless will work out many more stunts. For instance, you will find that you have the necessary equipment for making 60-cycle noises when a tin can is set on top of the magnet.

MOTOR MECHANICS

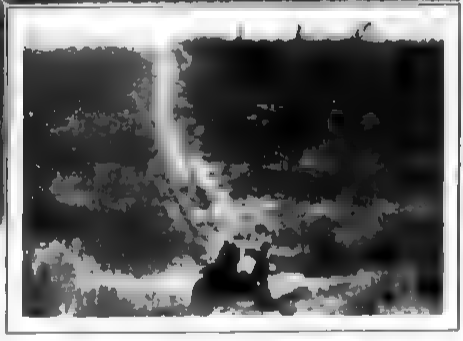
Edited by RAY F. KUNS

THRILLS *and* CASH *for* Motorcyclists

by **Theodore Hodgdon**

The author of this article, one of the leading authorities on motorcycle hill-climbing and racing, tells here how to prepare your motorcycle for Class "B" hill climb events, where you can win cash awards for your riding skill.

An exceptional view of a rider on his "home-brew" hill climber. While this may look spectacular, this rider has full control of his machine. You will notice that his feet are firmly placed on the footboards, he is throwing his weight forward over the front wheel, and with his left hand he is turning off the power to bring the machine down.



An excellent view of the type of test hill which the amateur should select for his trial rides. Always hit the hill squarely.

ALL the thrills of an exciting sport plus substantial awards, await the amateur motorcycle competition rider in 1932. During the last year there were 60 Race Meets held in the U.S.A., 160 hill climb contests, and 150 motorcycle polo matches.

In these events, held on Sundays, holidays and Saturday afternoons, only the professional riders were allowed to accept cash prizes for their winnings. However, for 1932 the rules have been changed to make the lot of the amateur or Class "B" rider more profitable. Now, if you prepare your motorcycle carefully and go out to win a hill climb, you can take cash for your winnings.

At many hill climbs the list of prize money totals from $300 to $400, while at some of the larger sectional or national championship climbs the prize money runs as high as $1600, all of which is split up among the riders who win first, second, third, fourth and fifth places in the afternoon's sport.

You Can Make Your Motorcycle Pay!

In other words, the motorcyclist who starts out to ride his way to victory in hill climbs this year, can make his spare Saturdays, Sundays and holidays, profitable and filled with the thrills of an exciting sport.

"But how," says the motorcycle owner,

"can I fix up *my motor* to compete in the hill climbs and *win?*"

Stock Motorcycles Can Be Made Over

As a matter of fact, the rules of the American Motorcycle Association provide for 1932 that every promoter of a hill climb contest *must* schedule on the program an event for Class "B" riders mounted on 45 cubic inch motors of pocket valve design, like the Indian Scout "45" or any other stock "45" motorcycle which you can buy, and such as many riders now own.

In other words, if you already own, or if you purchase a Scout "45" or other 45 cubic inch motorcycle, you are eligible to compete in these contests subject to the rulings of the big governing body which rules over such events. (These events are also open to 30.50 cubic inch motorcycles of overhead valve design, if catalogued by the manufacturer.)

What To Do

To prepare the stock "45" for hill climbing there are five distinct steps to follow, listed below:

1. Motor should be completely overhauled and "souped up" to deliver more horse-power. (Compression raised, alloy pistons installed, etc.)
2. All needless friction must be positively eliminated. Wheels must roll easily, transmission, chain and sprockets must be perfectly lined up to "roll free."
3. The whole motorcycle must be as light as possible for hill climbing. (All excess weight such as head lights, tool boxes, front mudguards and all unnecessary fittings removed.)
4. Saddle, handle bars and foot-boards must be located to bring the rider's weight quite well forward. (This is necessary for balance while riding up the steep slant.)
5. The rear wheel should be fitted with a skid chain as shown in the illustration, and the motor should be geared down to pull in high gear at all times. This is done by a large sprocket on the rear wheel of about 70 teeth on a Scout "45," as shown in the illustration.

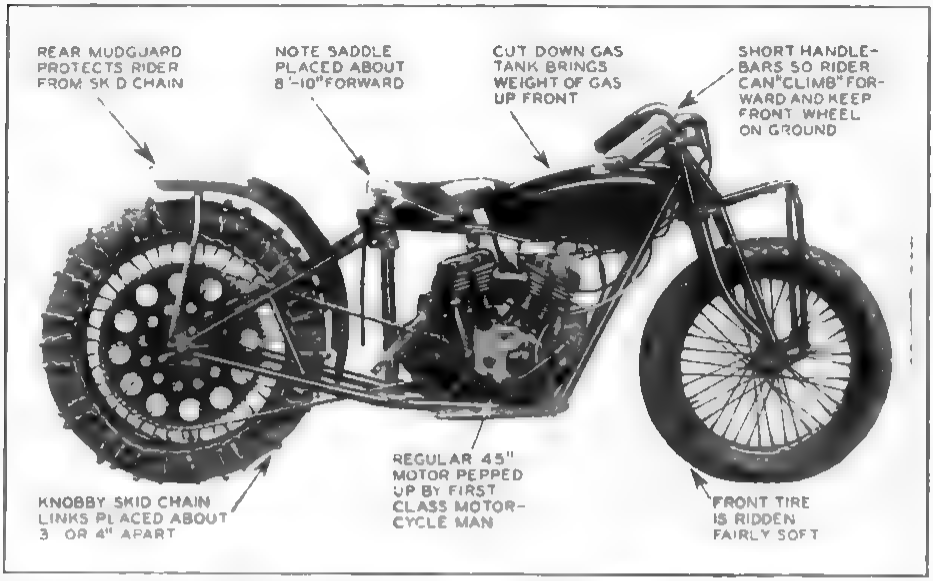
If you attempt to ride a hill in low or second gear, the gear box will be

An excellent impression of a hill climber on a side valve job. A good impression of the speed he is making is shown by the fact that both wheels are off the ground.

To bring your machine back down the hill, lean on the tank, manipulating the brake pedal with your left hand and using your right for steering—and your feet dragging.

Here is an amateur who is not in full control of his motorcycle. To win, you must keep your feet on the boards. A firm footing also helps the rider to keep complete control.

All Excess Weight Must Be Removed From Motorcycle for Hill Climb



Here is shown a stock motorcycle which was prepared especially for hill climbing by an amateur. Note the large sprocket on the rear wheel, the knobby skid chain, and the saddle placed well forward toward the shortened handle bars.

using up a fraction of the horsepower which you need to win. Therefore, gear your 45-inch motor about 13 to 1 in high gear, whereas the ordinary road job is geared about 5 to 1 for road use. Some hills will require a higher gear than 13 to 1 and other hills will demand a lower gear.

This change in gearing is made by putting on a larger or smaller sprocket on engine or transmission, say a 13, 14, or 15 tooth sprocket.

Hints on Riding the Hill Climber

After the motorcycle is in top notch condition, according to the above rules, the rider had best make some practice rides and tests on a short but very steep hill which he may locate in a pasture or sand pit, but preferably on fairly smooth hard ground free from rocks.

Straight Start Is Essential

One of the first essentials for a successful straight ride over the top of a hill is to start squarely facing the course.

Sit firmly in the saddle, make sure your engine is thoroughly warmed up and that it will take full throttle without spitting or skipping. Then make sure your front wheel and the whole machine *faces exactly* the course you intend to ride over the hill. Then wind open the throttle and let the clutch in smoothly but firmly.

Balance Fore and Aft

When you find yourself started up the hill, if your front wheel tends to "rear up"—climb forward on the machine—*feet firmly on the footboards*—don't ride with your feet dragging!

For the first few rides you may find it almost impossible to balance the machine over the bumps and rough places without using your feet, but remember—when you stick out your feet to balance or get back onto the course you were not "riding it" and to win you've got to *ride!*

There is little more to say except that hill climb riders—even the best of them—take spills when the hill is too steep or the ground is too rough but a spill is just a toss—no rougher than the scrimmage football played by ten year old boys.

Never in the records of the sport of hill climbing has anyone been seriously hurt. It is just one of those thrilling sports which puts on a spectacular appearance but where the danger element is not anywhere near as large as in a game like football.

Remember—to win you must ride, just as in a baseball game you must make hits and runs and the harder and better aimed the hits, the longer will your runs be!

Few Handy Hints for Motorists

DO NOT overlubricate the front wheel hub. A teaspoonful of grease on a bearing is sufficient. More will get into brakes.

A hand scrub brush may be used with soap for scrubbing the roof of a car when it is desired to clean it for repainting.

Erratic engine performance often results from the burning through of the riser tube in the carburetor and intake manifold assembly.

String Instrument Amplifier May Revolutionize Music

The volume control of the amplifier is a simple foot pedal easily operated by the player, as shown in the photo above.

HERE is the latest in symphony orchestra equipment—a tone amplifier for string instruments. Melville Clark, noted harpist, is shown in the accompanying photo demonstrating the amplifier which he spent seven years perfecting, and which gives promise of revolutionizing the string section of all concert orchestras.

The new attachment consists of an amplifier which is connected to the bridge of the string instrument as shown in the photo. The volume control is operated by the player by means of a simple foot pedal. New life, beauty and color are said to be given to the tones of the strings by using this electrical medium.

This Gas Tank Cap Can't Be Lost

NO MORE lost gasoline tank caps after you install this one. It consists of a metal chain with attachments at either end for attaching the cap to the filler neck of the tank, as illustrated. Cap can be installed in a minute without tools and does not interfere with filling the tank.

Chain holds tank top as shown.

If not replaced by station attendant, the cap will bounce about on the tank causing a noise that soon attracts the driver's attention and prevents wasting of gas by spilling out of the tank.

Color Scheme Helps Cure Insane

WORKING on the theory that certain colors have powerful effects on the human mind, especially on people who are mildly insane, managers of French asylums are devising a color scheme which, they believe, will help restore the patients to normality.

Experimental results show that red is a stimulating color and therefore good for depressed patients. Blue is depressing and recommended for excited people.

Cigarette Lighter for Motorists

A NEW lighter that puffs your cigarette alight for you while you are driving is now on the market. You merely insert the cigarette in the hole in the knob of the lighter as shown in the photo, press the knob down, and in six seconds the fag is lighted. The lighter is clamped to the dash board and automatically shuts off when the knob is released.

Flipping the switch ejects lighted fag from automatic lighter.

Easy Way to Sand Holes in Wood

EVERY wood-worker is looking for a simple method of sanding holes in wood. Here is a suggestion. After drilling the hole, choose a drill smaller than the hole, wrap it with paper until it fits loosely in the hole and then add one sheet of sand paper. Sand paper can be fastened by using gummed paper. Using this prepared bit in an ordinary brace, as illustrated, will keep the hole perfectly round.

Above is demonstrated a simple, quick method of sanding out holes and keeping them perfectly round by use of drill.

Things to Make with Tools

Edited by A. HELLY HALL

How to do Inlay Work with Sealing Wax

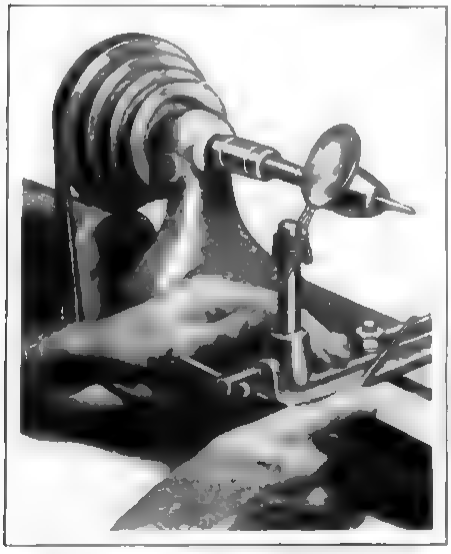
AN ART long practiced in India is the inlaying of tooled metal articles with colored sealing wax, producing an effect very much like the more difficult enameling. You can do the same thing in your home workshop, without using expensive tools or materials.

From novelty stores you can obtain, for 25 cents, small brass vases and other articles of Oriental manufacture, having engraved designs. Or you can prepare your own plaques and name plates from sheet copper or brass by covering the surface with paraffine, scratching the wax from the parts you want to fill with sealing wax, and etching to a moderate depth with nitric acid.

To fill the depressions with colored wax, warm the article moderately, and flow the wax into the grooves by means of a heated copper rod or wire having a fairly sharp point, as illustrated in the accompanying photo. Or you can powder the wax and rub it in with your fingers.

Then remove excess wax with a sharp knife or with some solvent such as carbon tetrachloride. Finally, fire polish the inlay by holding for a few seconds above a bunsen or alcohol flame.

The colored wax is melted into the depressions with a heated copper rod as illustrated here. Fire polish the inlay by holding the vase above the burner.



Here is how reading glass is lashed to lathe rest support.

Magnifier for Lathe Work

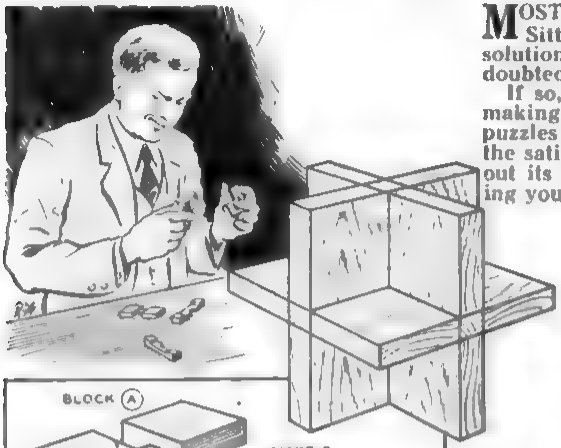
WHEN doing small work on a lathe you will find that you will be able to do the cutting more accurately if you can get a clearer view of what is going on. What will be of immense assistance here is a large magnifying lens or reading glass to permit a more detailed examination of the material being turned out.

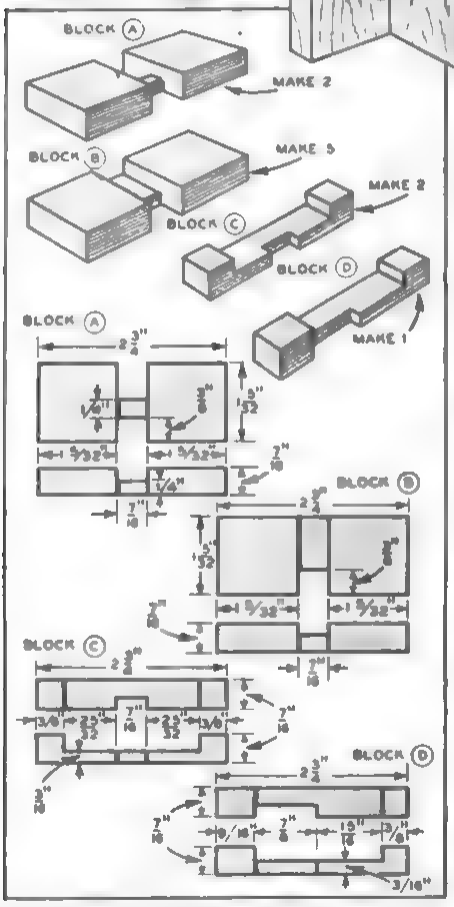
The magnifying lens in its holder is secured with lashings to the tool post of a metal working lathe, or to the rest support of a wood lathe, as illustrated in the drawing at the left.

Note the angle at which the glass is set. In this position it acts as a guard against flying particles as well as an aid to sight.

The view can be adjusted by adjusting the rest, so that you can watch closely the cuts which your tool is making. Not only is a reading glass serviceable on lathe work, but it can also be used in conjunction with a drill press or precision grinder. You will be surprised at the increase in ease and accuracy with which you can work.

SHARPEN Your WITS on





The blocks should fit tightly together when assembled as shown at the top, leaving no indication as to which is the key block of the puzzle. In making the blocks, follow the dimensions above closely, and remember that the success of the puzzle depends on clean-cut, closely-fitting corners.

MOST everyone is susceptible to puzzles. Sitting for hours pondering over their solutions is not an uncommon thing. Undoubtedly you have done it yourself.

If so, you will have a lot of fun out of making one of the six-sided cross block puzzles explained in this article because of the satisfaction you will get from working out its solution yourself, and then watching your friends fuss over it.

When making this puzzle, remember that the parts must be accurately cut so that they interlock with such snugness that the key block cannot be easily detected. The better the workmanship, therefore, the better the puzzle.

Because the blocks will be subjected to rough handling, pulling and twisting, only a tough wood that will not split or wear away easily is suitable. Maple, apple, pear or similar close-grained woods will answer the requirements.

The making is simpler than you might expect, since there are only four different shapes for the ten parts. Their shapes and dimensions are shown in detail in the accompanying diagrams.

Saw Out Blocks From Strips

Rip from the stock you have selected a strip 7/16 inch square and another strip 7/16 inch thick by 1 5/32 inches wide. Make each of these strips long enough to allow for the cutting out of a few extra blocks.

There may be a slip-up or two in the cutting of mortises and grooves, and these extra blocks will come in handy.

Lay out the blocks on these strips following the dimensions shown in accompanying drawings and do all the mortising and grooving before separating the blocks. You will find it much easier to handle the strips than it would be to work with the small blocks.

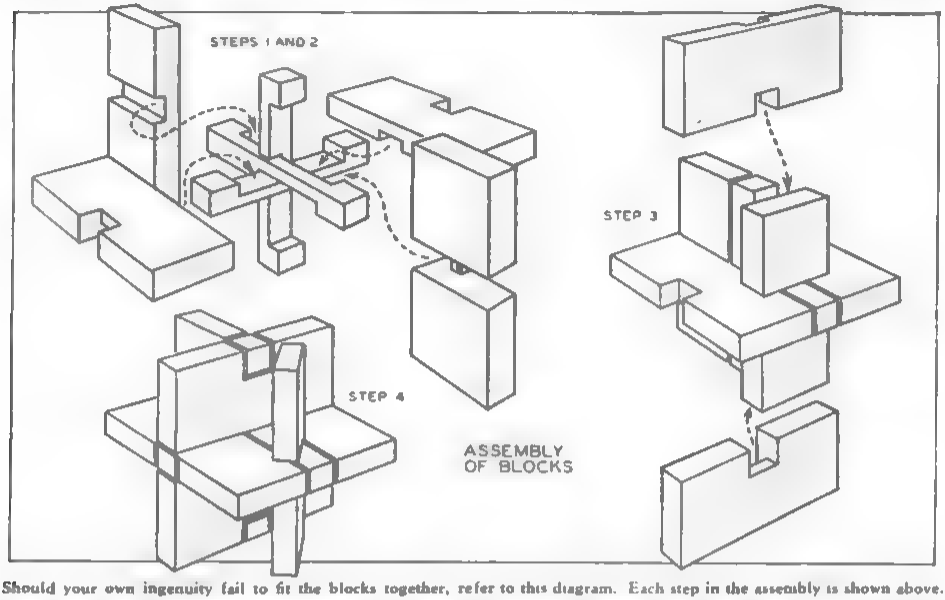
If you have a circular saw in your shop, you can do all of the cutting with it. This is an easy way to get the clean-cut, square corners which are essential for the close fitting joints of the puzzle. If you haven't a circular saw, use a hack-saw or coping saw, and a chisel for the cutting.

Bevel Edges Carefully

You will notice in the detail of the key block that the small square shank at its center is slightly beveled. The bevels are necessary so that the key block may be turned in assembling and knocking down the blocks.

It may be necessary to bevel the inside edges of the mortised portions of the blocks very slightly to make assembling smoother. This is a jack-knife operation. Trim sparingly, and only where absolutely necessary. A thin shaving too much will make a loose

This Wood Block PUZZLE



Should your own ingenuity fail to fit the blocks together, refer to this diagram. Each step in the assembly is shown above.

joint and an ill-fitting assembly. If you should overtrim a block, it is best to replace it with a new one.

When you have completed the set of blocks to your satisfaction, sandpaper all surfaces clean and wax them. Outer corners of the blocks may be rounded if desired, but it is best to leave them square as the rounded corners tip off the solution to the puzzle. Puzzle solution is shown above.

Make Your Own Portable Electric Paint Sprayer for Less Than $15.00

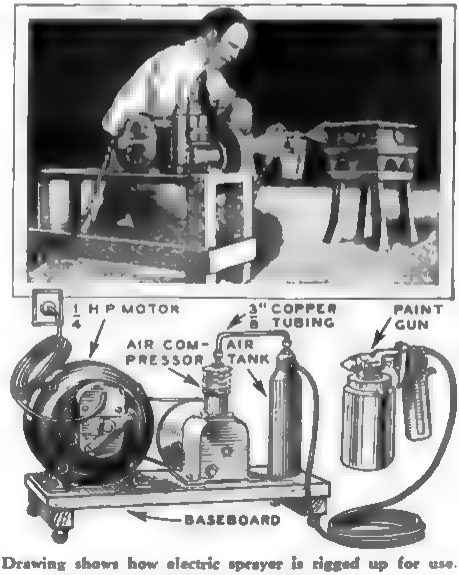
WITH this portable electric paint sprayer shown on the right, you can paint your car, furniture or boat in a fraction of the time required when using a brush, and do a better job of it. The complete apparatus costs less than fifteen dollars and will actually do all the work of a sixty-dollar outfit.

The one-fourth horse power electric motor used to drive the compressor can be purchased very reasonably from a second-hand-store. The motor should be equipped with a "V" pulley 1½ inches in diameter. For the driving belt, a "V" type automobile fan belt is used.

Air Compressor Easily Acquired

The air compressor can be purchased at an automobile junk yard for about $1.00. These little compressors were standard equipment on the older Cadillacs. The cog-wheel on the driving end of the compressor is removed and replaced with a "V" pulley 8 inches in diameter.

Or, instead of removing the cog-wheel, you can turn a pulley on a lathe from wood and bolt it directly to the cog-wheel. The paint gun, air hose, and air tank can be purchased for about $5.50.

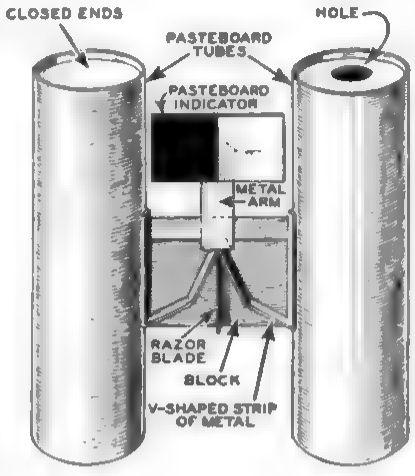


Drawing shows how electric sprayer is rigged up for use.

Meter Tells Weather 24 Hours Ahead

Indicator which predicts weather is viewed through hole in the case. When black is seen fair weather is ahead; when white shows, look out for rain in next 24 hours.

The indicator, consisting of piece of pasteboard, is secured to metal arm, which is in turn soldered to V-shaped strip. Two tubes should balance precisely on razor blade.



Two pasteboard tubes, one with closed ends, other with hole, as shown here, are connected with V-shaped metal strip which rests on razor blade mounted in block on rear.

A WEATHER meter is not necessarily an intricate and mysterious piece of apparatus. For instance, this weather meter is very simple and yet very sensitive and will accurately predict rain or a change in the weather twenty-four hours ahead.

As the size is immaterial, the builder can make the meter as large or small as is desired. First make two pasteboard tubes with closed ends, of exactly the same size. One tube has a hole in one end, and both should be given a coat of thin shellac.

Fasten them together with a flat strip of light metal formed into an inverted "v" in the center as shown. After making the wood case for the instrument illustrated in the top left drawing, remove the back and to it glue two blocks with a razor blade between.

Balancing the Pasteboard Tubes

Balance the paper tubes on each side of the razor blade, supported by the inverted "v". This forms an extremely sensitive balance. If one tube weighs more than the other, brush a few more drops of shellac on it.

A "signal" device, or indicator, is next attached to the "v" piece. It is merely a metal arm with a piece of cardboard, one-half of the latter being painted black and arranged to be seen through the window of the completed meter.

The white side of the cardboard should be nearest the tube with the hole in it.

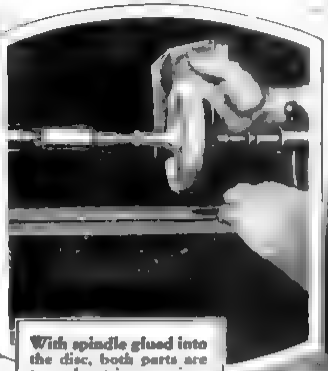
Installing Indicator in Case

The apparatus may now be installed in the case after boring several holes in the latter to admit air. The principle on which the weather meter works is that in case of approaching rain the air becomes lighter. It can enter the tube with the hole in it but not the sealed tube.

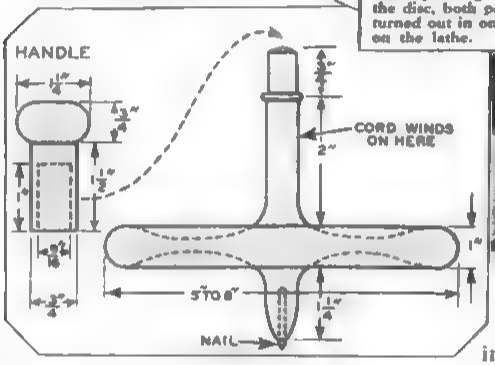
Consequently the delicate balance is upset, the sealed tube falls and the signal shows white in the hole in the front of the box.

Earn Extra Cash by Turning Tops on Lathe

To hold top steady, handle is fitted over top, down against shoulder, as shown.



With spindle glued into the disc, both parts are turned out in one piece on the lathe.



Here are dimensions for top and handle. Note how nail is driven into bottom of spindle to provide sharp spinning point. Turn concave groove in disc as shown by dotted lines.

The top is spun by winding the cord around the spindle, then giving it a sudden yank. The top of spindle is held steady by the handle as shown in this photo

A MIDWESTERN home workshop fan recently worked out several good tops and averaged about $1 an hour for his labor. His most popular top was one of the type shown herewith. These sold at retail prices ranging from 25 to 50 cents each, netting a handsome profit to the craftsman.

This top will spin a long time for, owing to its construction, it is very well balanced. A block of clear white pine, 6 inches square and a full inch thick, is cut out and a ⅝-inch hole bored through the center. A stick of the same material, 5 inches long, is put in the lathe and turned down ¾ inch in diameter to a point 2¼ inches from the tail stock.

The spindle is covered with glue and the block driven to a tight fit. Then the whole piece is turned to the dimensions shown in the above drawings, so that in reality it becomes a single piece. The top portion of the spindle is cut to ½ inch in diameter and provided with a shoulder.

The turning done, the piece is sanded and then painted in two colors—the rim one color and the spindle and inner portion of the wheel of another. Finally, the top or hand piece is turned from a small block of wood fixed to a small screw center face plate. To use, cord is wound about the spindle while the top is held upright by the removable knob.

Strange Noises Come From Cup When Finger Is Drawn Over String

WANT to have some fun making the most unearthly sound you ever heard in your life? Then try this simple stunt. First, lay hands on one of those waxed paper drinking cups such as are used on picnics, and pinch a small hole in its bottom. Now procure a strong cord and resin it thoroughly, then knot one end, as shown in the accompanying drawing. Thrust one end of the string through the hole in the cup and tie it around a match stick to hold it in place. When your hand is drawn along this resined cord awful sounds will issue from the cup, which acts as a resonator for the string.

Draw hand along resined string to make noises.

BUILD a Little HOUSE

Built from Plan No. 6-W-56, this home has extra one room apartment which brings in small income for the owner. As the house appears very costly, it has large resale value.

A complete kitchenette apartment within a very attractive home is the plan offered by Mr. Flagg this month. When rented out, the apartment will bring in a sizeable income to cover taxes, etc., and insure complete privacy in the bargain.

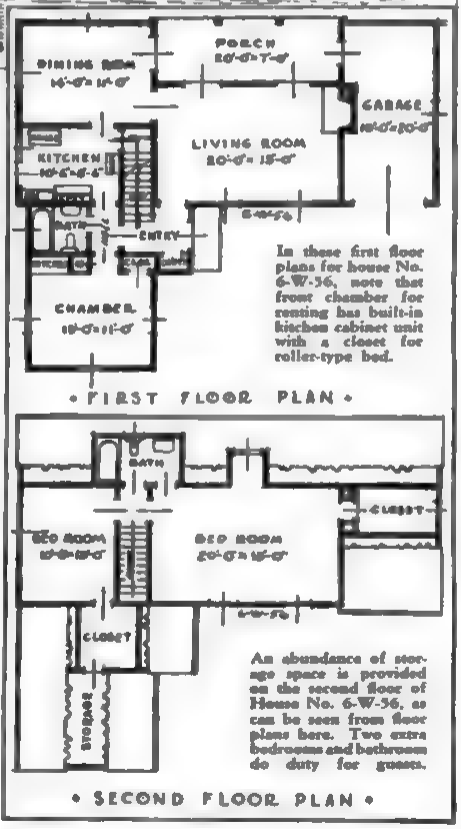
IN THESE days of lean pocketbooks when anyone with cash to invest is trying to obtain an assured, even though small, income, why not, if you are planning to build, consider a little house within a house?

The idea sounds like a trick or stunt. It's not at all. It's a practical scheme to produce a small but satisfying return on an investment. By spending an extra $500 at the beginning you may find a welcome monthly money return in the end. At any rate, the idea is worth thinking about. It is the reason for this story and house No. 6-W-56 designed especially for MODERN MECHANICS AND INVENTIONS readers.

Apartment Rent Pays Taxes

In the March issue we showed a rent-a-room house where the tenant enjoyed a reasonable degree of privacy and the rent money supplied the owner enough cash to pay taxes. The house here illustrated, No. 6-W-56, carries the idea still further.

The front room on the first floor is a complete one-room kitchenette apartment with built-in and collapsible features that offer service and comforts of two or more rooms.



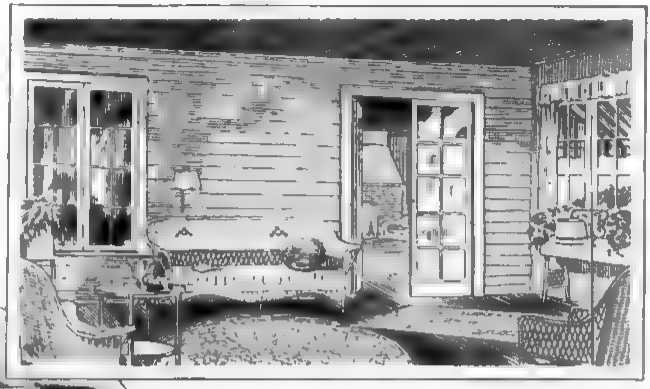
Here is the complete layout for house No. 6-W-56. Tenant of the kitchenette apartment enjoys complete privacy. For complete plans for this home, mail $1.00 to Modern Mechanics Home Building Editor, Minneapolis, Minn.

WITHIN a House

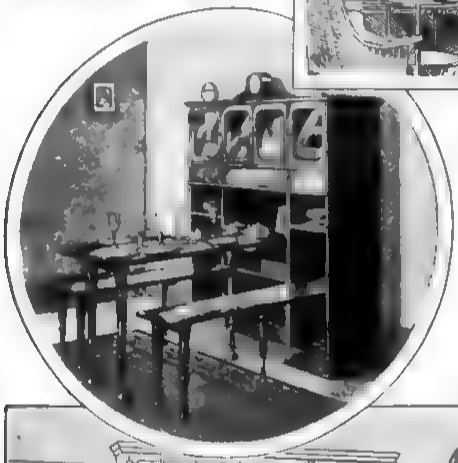
by Maurice I. Flagg

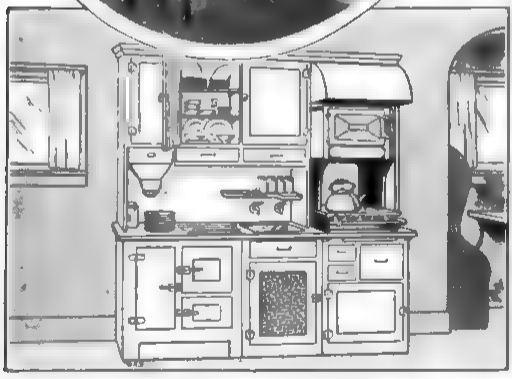
HOW TO GET A BLUE PRINT AND TWO PLAN BOOKS

A one-sheet blue print of any house appearing in Modern Mechanics and Inventions magazine may be had for $1.00, postage prepaid. Two new plan books, "Homes for Newlyweds," containing 32 of the latest ideas for low cost homes in all styles, and "16 Selected Homes for Lean Purses" containing time, space, and labor-saving bungalows, may be had for 15 cents each, or both books for 25 cents, postage prepaid. Address Home Building Editor, Modern Mechanics and Inventions Magazine, Minneapolis, Minn.



The semi-enclosed porch overlooking the garden to the rear may be furnished as shown above to make an ideal summer time living room. French doors are a feature.





Above—Latest in small apartment fixtures is small breakfast set which, when closed, looks like a china closet set against the wall. Below—Complete service unit for one unit apartment includes ice box, range, and all equipment for light housekeeping.

In other words, it is a complete little house within a larger house and an income producer.

Aside from the possibilities of renting the apartment to a tenant, the owner may at some time wish to rent the main part of the house instead of the apartment. In this event he and his wife can move into the apartment. It's being done by many a landlord in these days of depression.

The space allotted to the apartment is flexible. It can be used as a first floor bedroom provided you do not like the kitchenette idea.

In fact you need not build the room at all. The house has been so designed that floor plan and the exterior appearance are quite complete without it. By omitting the room there would be a saving of around $500.

The general shape of the house is an L-type which lends itself well to construction on a fair-sized lot. A property of 55 or 60 feet frontage is desirable. If you omit the attached garage and build it at the rear, then the house may be placed on a 45-foot lot.

House Has Sun Porch in Rear

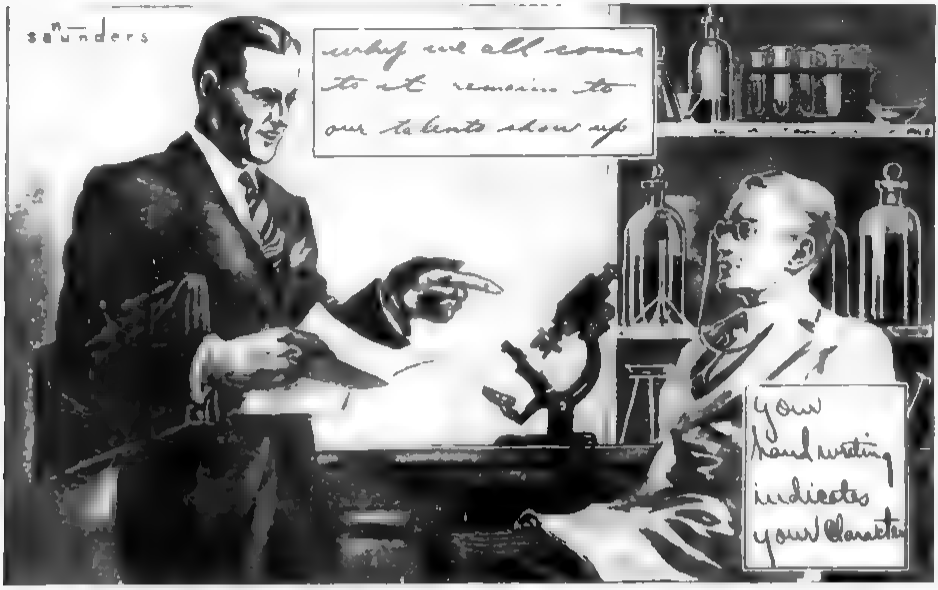
There are four rooms, a bathroom, semi-enclosed porch overlooking a garden to the rear, and an attached garage called for on the ground plan. Two bedrooms, a second bathroom and two unusually large closets complete the second floor plan.

The front room on the first floor or chamber as designed on the plan is the space allotted to the one-room kitchenette apartment. It has three windows with plenty of light and ventilation. The room is serviced by a built-in kitchen cabinet unit including electric icebox, small gas stove and storage space for groceries and cooking utensils.

A closet accommodates a roller type bed. The bathroom, while planned as a part of the apartment, may be used by other occupants of the house. With a bathroom on the first floor and the front room used as a bed room rather than an apartment, you

(Continued on page 189)

Your Handwriting Analyzed Free



Handwriting such as that shown in the upper specimen indicates a friendly, expressive and emotional nature which makes for success in salesmanship. The handwriting in the lower specimen reveals a reserved and non-expressive nature, more suitable for scientific and mechanical work. Send a specimen to Mr. Bunker for free analysis and check up on yourself.

MR. M. N. BUNKER, famous grapho-analyst, has found, after years of study, that your handwriting "tells all." The way you slant your writing and the characteristics of your written letters reveal your talents and your nature with remarkable accuracy.

If you think that you would like to be a salesman and your handwriting slants backwards like that shown at the bottom of the above illustration, you should get that idea out of your head immediately, because your nature is not the type that makes for a successful salesman.

In the same manner, if you desire to be a mechanic, an engineer, or to work in some scientific field, and your writing slants far forward like that shown in the upper specimen of the illustration, you should also get that idea out of your head. Your nature is no more fitted to deal with scientific things than the owner of the first specimen is for salesmanship.

Forward Slant Reveals Sales Ability

Mr. Bunker has found that the natural-born salesman slants his writing very far to the right, as in the upper specimen. The reason for that is that in the science of handwriting analysis expressiveness is determined by the slant of the writing.

It has been found that the person who uses this far forward slant is invariably an emotional type of individual—an individual who loves to make friends and who loves to express himself and show his feelings about things.

He is able to talk easily, and to say what he wants to say so that other people can understand it. These characteristics are all natural attributes of the successful salesman.

Back Slant Indicates Reserve

On the other hand, people who write with a backward slant, or even with a vertical appearance to their writing, as in the lower right specimen in the illustration, are reserved in manner and keep their feelings about things very much to themselves.

If they possess certain other essential traits, they can make good in the world of science. They could not make good in the sales field because they do not have that necessary faculty for making friends; they do not know how to express themselves so that they can make others feel the same way they do.

The science of grapho-analysis reveals many other talents other than the ability to sell or succeed in the scientific world. If you have musical talent, your handwriting will reveal it; if you are fitted to be an artist, your writing will tell the secret.

Your latent powers and talents, as revealed by your handwriting, will be analyzed for you free if you will send a stamped, self-addressed envelope, together with a specimen of your handwriting to M. N. Bunker, care of Modern Mechanics and Inventions, 529 So. 7th St., Minneapolis, Minn.

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WINDING roads beckon to you — lakes and streams bid you come — mountain trails challenge the eager power of your Harley-Davidson.

Come on out with the Jolly Riders — good fellows all — Harley-Davidson enthusiasts, always ready to welcome you to the Sport of a Thousand Thrills.

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Look over the 1932 Harley-Davidsons at your Dealer's. Ask about his Pay-As-You-Ride Plan. Today!

$195 *at the factory, is the low price of the Harley-Davidson Single—a completely equipped, speedy, sturdy motorcycle. And it costs almost nothing to run!*

Ride a
HARLEY-DAVIDSON

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Harley-Davidson Motor Co., Dept. MM, Milwaukee, Wis.
Interested in your motorcycles. Send literature.

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Address_____

My age is ( ) 16-19 years, ( ) 20-30 years, ( ) 31 years and up, ( ) under 16 years. Check your age group.

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The new low price brings with it no change in the size and quality of America's greatest magazine of sensational true stories of crime and mystery. Read details the police withheld — intimate revelations no newspaper dared print.

Among the great features included in the May issue which is now on the news stands is "The Inside Story of Hawaii's Honor Slaying," "The Clue of the Bronze Slipper," "Trapping Chicago's Blond Tigress," "The Skeleton Harvest of Maple Hill Farm." Ten great true stories of real life mysteries with actual photographs.

MAY ISSUE

STARTLING Detective ADVENTURES

10c .. Now On Sale .. 10c

Best Mechanics Will Win War

(Continued from page 49)

If our present armed forces might be capable of holding the enemy at bay for a period of 18 months or two years, we'd be in position to mop up the earth with Japan. A short and decisive land campaign would drive the Japanese out of Korea and Manchuria. This would cut Japan off from her present supplies of coal and iron.

With the recaptured Philippines as our base of naval operations we'd merely have to throw a blockade around the Japanese islands. With her commerce throttled she would be cut off from essential supplies of war materials, and starved into submission within three months after the blockade became effective.

Proof of the dependence of the Japanese on the brains of foreign mechanics may be graphically proven by one of the photographs accompanying this article, showing a fleet of Japanese battle planes. The significant fact here is that practically all the planes are of British manufacture. Japan, in other words, has built up her air fleet by purchase from foreigners—few of her planes are built by Japanese mechanics, and practically none of them show these touches of refined ingenuity which are constantly apparent in the latest additions to Uncle Sam's fleet.

Jap Plane Carriers Are Novel

In the construction of airplane carriers Japan has achieved her one claim to distinction. In contrast with American and British practice of mounting the smoke stacks in a mast projecting vertically from the extreme side of the ship, the Japanese have strung their smoke stacks lengthwise of the vessel, leaving the top deck entirely free from all encumbrance.

The theory of this presumably is to keep vital control units protected inside the ship, and to eliminate obstructions on deck in case of inexpert landing. Unique as this method appears, it has its disadvantages. There is a real reason for tall masts on a battleship. Observers in the crow's nest can cover an infinitely greater area of the sea than a man can from a low deck. Defense and attack fire can be directed much more efficiently.

Prevailing features of battleship design are principally of British and American origin. Battleships are armored much more heavily beneath the water line than above, for the reason that this is the principal region of vulnerability. Whereas above water six-inch armor plate is usually standard, below the water line it may vary from 12 to 22 inches in thickness.

To be effective, a shell must penetrate this armor and explode **inside** the vitals of the ship, wrecking boilers and machinery. Numerous bulkheads keep a battleship afloat, even though it may be shell-riddled and filling with water. Longitudinal bulkheads divide a battleship in two. There are at least two power plants, one on either side of the ship, so that if one is destroyed the other still functions. Four separate drive shafts are usually employed on battleships.

(Continued on page 176)

New *Delta* Drill Press

Has Many Unusual Features

THIS useful quality tool should be in every workshop. It is quick and efficient in drilling, boring, grooving, sanding, and mortising. Has many additional uses. Works with metal and composition as well as wood. It is a sturdy, oversize machine built for exacting production work, yet is surprisingly low priced. Incorporates numerous special features such as: Husky Graduated Quill, Perfectly Balanced Ball-bearing Spindle with Sealed Lubrication, Tilting, Swinging Table that levels automatically, and many more.

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For complete details send for the FREE 48-page Delta Catalog TODAY! It shows complete line of improved Motor-Driven Jointers, Circular Saws, Jig Saws, Band Saws, Sanding Units, Woodturning Lathes, Moulding Cutters, Borers, Routers, and Mortisers. All husky, accurate, efficient units—which are now available at astonishingly moderate 1932 price levels!

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32-page book—50 illustrations, shows how to use drill press properly—how to sharpen drills—how to perform many special operations. Send only 10c with the coupon at right.

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3775 N. Holton St., Dept. M-532, Milwaukee, Wis.

Please send me, without obligation, 1932 Delta Catalog. Also send full details of your 10-day Trial Offer and Easy Payment Plans

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City ..... State.....

☐ I enclose 10 cents for 32-page Drill Press Book.

Thermometer Divining Rod

THERMOMETERS are put to a multitude of uses in the present day, but a thermometer in the role of a divining rod that detects the presence of oil in the depths of the earth is a unique addition to its repertoire. Modern prospectors simply lower the thermometer into a pipe that has been sunk, and when they find that the earth beneath has a relatively high temperature, they know that they are about to make a strike.

Investigations being carried on by the U. S. Geological survey give considerable evidence that earth temperatures in most oil bearing areas are relatively higher than those of water bearing areas. For example, in the oil fields of Texas, Kansas, and Oklahoma, the temperature was found to increase 1 degree Fahrenheit in fifty feet, while conversely the water bearing regions of Iowa revealed much lower temperatures.

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Work for Uncle Sam. Get good pay, regular increases, vacations and sick leave with pay, steady advancement, pension. Send for my free book *"How to Secure a Government Position"*—tells about all jobs, near home or traveling, the money, what you need to know and how to get posted. Forget "job hunting." Open to citizens 18 to 50. **IMPORTANT**—Get ready NOW for the next Railway Postal Clerk Examination! Yearly pay with allowances averages $2750.00. Prepare yourself NOW. Send coupon at once.

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Name .....

Address .....

Best Mechanics Will Win War

(Continued from page 174)

Airplane carriers are particularly important in any consideration of possible war with Japan, because our air fleet would be a vital element in deciding the conflict, and our three plane carriers are the only means we have of transporting planes overseas.

In one phase of air defense the United States navy is without a peer—that is in the use of dirigibles. The common conception of a dirigible, such as the Los Angeles or the new Akron, is of a highly vulnerable mechanism which would be immediately destroyed if it tried to make itself useful in time of war.

Dirigibles Unrivaled as Scouts

But there are good reasons why the navy refuses to abandon the dirigible. Experience has proved conclusively that it meets an invaluable naval requirement that can be met by no other type of aircraft. It is a powerful auxiliary to a navy of battleships, destroyers, airplanes, and submarines. Its field of operations is far out at sea beyond the striking range of airplanes.

No airplane has yet been built that can operate in all weather. Rain, sleet, snow, hail, fog, and lowering clouds, still put our airplanes on the ground. The dirigible has nothing to fear from such weather. High wind is its only weather enemy, and even that bugaboo is apparently due to disappear by reason of recent structural improvements.

The modern dirigible has a load-carrying capacity that is equivalent to a whole fleet of large bombing planes. It can remain in the air for days at a time. Its cruising radius is hundreds—thousands of miles at sea completely independent of land or floating bases of operation. The discovery of helium and its production in sufficient quantity eliminated the cause of most previous airship disasters. Helium has, also, rid the dirigible of its former major element of military vulnerability.

The invaluable function in the dirigible is its ability as a scout. Thousands of miles at sea, beyond the operating radius of airplanes, and at high altitudes not feasible for airplanes, an airship such as the U. S. S. Akron is capable of operating for days at a time, and at twice the speed of the fastest surface ships. It is the only aircraft that offers inhabitability to men during such protracted voyages, and the only aerial vehicle capable of carrying a powerful and dependable radio equipment on such long flights.

Airships Mostly Defensive Weapons

Thus, for deep sea scouting purposes the airship meets a naval requirement that is highly important to the United States navy. And to all these advantages must be added the airship's ability to cruise at slow speed, to hover over any spot for detailed observations, the capacity for making photographic records and developing them immediately, and the ability to communicate by radio with our war department at any and all times. If necessary, the airship can carry substantial loads of ammunition, stores, and supplies.

In no sense does the American navy look upon the airship as an instrument of offensive warfare. It is a scout, a repeller of naval attack against our seacoasts, and a destroyer of enemy submarines and merchant shipping. Nothing more is claimed for it, yet in these roles there is every reason to believe that a large fleet of dirigibles such as the U. S. S. Akron would render the United States immune from naval attack—hence, immune from having war waged on us.

What 100 Akrons Could Do For Us

Let us suppose, for example, that we have a fleet of one hundred airships such as the U. S. S. Akron. Then let us assume that Japan declared war upon us. We could logically expect the enemy to attempt a surprise attack upon our seacoast. He would, also, undoubtedly try to seize the Panama Canal.

Under such circumstances our airship fleet would immediately put to sea. We could assign 40 airships to scout duty in the Atlantic to completely frustrate any possibility of surprise attack. Those 40 airships would establish a patrol, beyond the striking range of airplanes, from Canada to South America. The other sixty airships would be assigned to the greater water area from the west coast of South America to Hawaii, and from Hawaii to Alaska.

These airships on patrol duty would fly at an average speed of 60 miles per hour, and with normal visibility extending 20 miles on each side of the ship, a single airship would be capable of scouting 57,600 square miles of ocean every 24 hours. This is an area equivalent to the combined area of all the New England states, through which not a whale or a school of porpoises could swim without being

sighted. A fat chance the enemy would have to get at us with battle fleet, aircraft, or sub-[illegible]

But the dirigible is of great size and highly vulnerable to gun fire, claim the critics of the navy's faith in the airship. Quite right. The navy knows it. But that does not help the enemy after an airship has done its work and spoiled his chances for success. Such an airship fleet would "spot" any Japanese fleet attempting to make a sneak upon us while it is still many hundreds of miles at sea. The position of the enemy fleet, together with highly important information regarding the nature of his attacking force, would immediately be radioed from the discovering airship to our war department. Our battle fleet would immediately steam out to meet the enemy on the high seas.

It is entirely possible that we might stand to lose the airship discovering the enemy fleet at sea. The airship would probably be brought down by gun fire from the enemy's battleships. By that time, however, the airship would have completed her all-important mission. Her officers and crew would parachute out with life preservers to be picked out of the sea as prisoners of war. We would have lost a crew of about a hundred highly-trained officers and men, and a $4,000,000 airship. That would be a nominal price for the information that would frustrate a naval attack upon the Panama Canal, or upon some seacoast city such as New York, Boston, Los Angeles, or San Francisco.

Airships Defend Against Submarines

In addition to its value as a scout the dirigible is a veritable hell-hound for enemy submarines and merchant shipping. From an airship slowly cruising at an altitude of 500 or 1,000 feet a submarine has about the privacy of a fish in an aquarium. And once discovered by the airship—there is no escape for the sub! The airship can hover right over the submarine to let down a depth bomb with deadly accuracy.

It has often been said that the airship is cursed with great size and vulnerability. Theoretically this is true. Nevertheless, a dirigible such as the U. S. S. Akron coming in contact with an enemy battle fleet isn't quite the fat pig in the slaughter pen that it appears to be. A few tracer bullets fired through the U. S. S. Akron would do little or no damage, and since the helium is carried in numerous cells it would be necessary to virtually riddle the ship before she could be brought down.

The vulnerability of the airship to airplane attack is unquestionably much over-rated in the public mind. The aviator attempting to attack an airship such as the U. S. S. Akron would discover to his sorrow that such a raid lacks much of being an old-fashioned, World War balloon busting sport! Our modern dirigible carries its own fighting planes which can be released and taken aboard again while the airship is in flight. The aviator trying to attack the airship would have these fighting planes to reckon with.

TODAY you've got to do more than handle your job. You've got to learn something about the job ahead if you ever expect to hold it. Or the requirement of the job you now have may be *changing* — nothing remains the same these days! You can't rest on your oars.

How are you to meet these facts? What can you do to make progress — earn more money? Ask yourself these questions, then —

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That's the answer — the secret of success is spare-time study!

The statement is not an idle one — thousands of men in all professions testify to its truthfulness. One hour a day devoted to study may mean the difference between success and failure to you, as it has been the difference to these men.

Faced by the same problems that now confront you, they turned to International Correspondence Schools Courses and found in study of them the *training* they needed most. That training changed the whole course of their lives. Spare-time study can do as much for you! Mail the coupon!

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After: Jack Slavin At 65

Before: Jack Slavin At 45

You all know Jack Slavin, formerly Middleweight Champion Boxer of Australia and America. He's now 65, but when he was 45 he was bald. See untouched photos at sides.

When he was touring Asia the Sultan of Johore introduced him to a Hindu Prince who, in test, attempted to pull the few straggling hairs that remained at his temples. Jack was angry, and to appease his anger the Prince handed him a formula, saying: "Here, this will grow your d.... hair." Imagine his delight when it DID.

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435A Wisner Building, Rochester, N. Y.

Wing-Flapping Planes Won't Fly

(Continued from page 122)

experimental ship at the time of his death. The results obtained from this plane encouraged the formation of the Austrian Wing-Flapping Aircraft Co., which is now engaged in continuing Czerny's experiments.

The Czerny plane shows evidence of a serious and carefully thought out plan to utilize wing beats not only as a means of forward propulsion but also as a means of controlling stability, steering, ascent and descent.

Realizing that the larger birds, particularly the soarers, do not derive their lift and forward motion by employing action of the entire wing but maintain a constant and sometimes almost imperceptible motion of the outer wing, Czerny embodied this principle in his design. Consequently it is only the tips of the wings that flap on the Czerny plane—the main wing being a fixed surface similar to that found on conventional planes.

Moreover there is an attempt to utilize the air pressure itself to assist the flapping action and thereby dispense with the excessive horsepower usually required to move the wings. A 3½ horsepower motor on the experimental plane proved sufficient to flap the wings and with only two "feathers" in place on each wing it is claimed that the plane lifted from the ground.

Briefly described, the Czerny plane resembles a normal ship in general appearance with the startling exception that it has neither propeller nor vertical rudder. The main plane has at each tip a peculiar wrist-like device in which are mounted, fan-wise, seven flexible single spar wings or "feathers," the longest of which is about 6 feet long. These "feathers," being quite flexible, automatically adjust themselves to air conditions, and the motion of the wing. This quality, combined with the peculiar action of the "wrist," enables the wings to be flapped and moved in a rowing motion without the use of excessive power.

The general action of the wings in flight is a flapping, rowing motion but either action can be used at the discretion of the pilot. That is to say, if for instance the plane has to be landed in a small space, the pilot can control the wing beats so as to curtain the propelling action and increase the up and down flapping to land in much the same manner as a bird. This wing action is connected to the motor through the "wrists" by cables and gears. The "wrists" themselves are the secret of the inventor and no information is available on how the action is obtained.

The pilot can similarly control the wing action to take care of steering and maintaining lateral balance. The fixed tail is not controllable.

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See is and company. After I sent my thoughts he him he said he had no pleasure away from home "—New Orleans, La. "The man of whom we bought home changed his mind about furnishing. No hardly know why, but we do "—New Baltimore, Mich.

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How-to-Build-It

Brand new—the 1932 Edition of HOW TO BUILD IT, the Home Craftsman's Manual! Crammed full of plans for building things in your home workshop — profusely illustrated with photographs, working drawings showing all dimensions, everything presented in blueprint form and explained in non-technical language.

HERE'S WHAT YOU GET:

BOATS—Plans for Gannet, a 24-foot cruiser powered by a converted Ford motor; plenty of room for two to sleep in Gannet's cabin, and she'll take you anywhere. Then there's the Tin Can-oe—built from a sheet of galvanized iron for the youngsters; non-sinkable.

TELEVISION receiver built from a fan motor. Also a beginner's radio broadcast receiver which can be built for three dollars. Also the Robbins Long Distance low-power transmitter, just the thing for talking with fellow amateurs over great distances.

HOME-BUILT AUTOS—several of them, one an outboard motor car which does 40 miles an hour. Also a rubber band flivver, and the M M Speedster Body for Ford chassis.

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WORKSHOP TOOLS—Toys—air rifle shooting gallery—diving helmet from a water heater—model boats—compressed air fire engine shoots real stream of water—duck decoys—electric eye opens garage door—and hundreds of others.

On Sale Today at Your Nearest News Stand—Price 50c

If your news dealer is sold out, send 50 cents to Fawcett Publications, Inc., 529 S. Seventh St., Minneapolis, Minn., and a copy of the 1932 HOW TO BUILD IT will be sent you at once.

HERE'S HOW IT IS PRESENTED:

Each article is written by an expert in his line, whether it's radio, boat design, or workshop practice.

Every design described is accompanied by drawings or photographs (usually both) showing the step-by-step process of building. Drawings are all clearly done, with dimensions lettered in and all parts clearly pointed out.

Text matter is simply written—no fol-de-rols; tells you all you want to know and then stops.

HOW TO BUILD IT has a stiff paper cover that will resist wear and tear in the workshop. The book is the same page size as Modern Mechanics and Inventions.

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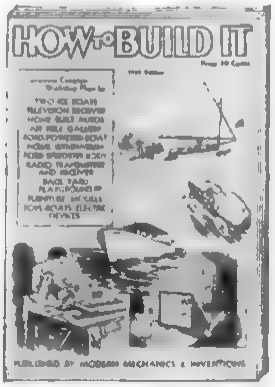
Look for this cover:



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Bungalow Trailer for Auto Campers

(Continued from page 131)

The construction of the folding side wall panels is obvious. The oblong holes in these panels are for straps.

Now for the detail construction of the beds. A wooden frame is built of ⅞"x6" pine. The overall dimensions of the frame are 6"x51"x74". ⅛"x1½"x1½" angle-iron is bolted to the inside of each end piece, and light, steel cable is laced between the two. Stiff springs at one end provide the necessary tension. The extreme side lacings pass through screw-eyes, and the lateral lacings are bound to the cable—not to the screw-eyes. A cotton or kapok mattress is used on the spring mattress.

Study the drawing which shows the bungalow trailer partly folded, and illustrates particularly how the mattress and blankets are strapped in the bed frame before folding. The sketch shows, too, how roller curtains are used at the windows; the removable, canvas panel at the door; and the folding steps.

One of the illustrations at the opening of this article shows the trailer completely folded. After the beds have been strapped and folded in place, the end walls fold down over them. A water-proof tarpaulin is lashed over the whole. The end elevation drawing shows the ample space beneath the beds in which to stow additional duffle—suitcases, and the like.

One more drawing finishes the job. The canvas work is quite obvious. The pattern can readily be determined, and the sections basted together. Then a tent and awning shop can do the machine sewing. The cost of this is trivial. Note that the canvas is attached permanently to the bed frames, but is fastened to the end walls with patent fasteners. When folding up the trailer, the canvas is detached from the end walls and folds up with the beds. A scalloped, awning border around the edges of the trailer enhances its appearance.

There! Now we've got a "rolling home." Regarding the drawbar attachment. The design of automobiles is so variable that no fixed design can be offered. But if one will drive one's car to a shop specializing on spring bumpers, the mechanics there can quickly dope out a suitable means of attaching the drawbar. Maybe one can pick up the fittings at the old junk yard. Many old-time cars were not factory equipped with rear bumpers; these were attached as an accessory. The usual fitting consisted of an expanding wedge within the channel of the car frame. If these fittings can be obtained, it will be a simple job to hook up the drawbar to them.

Lighting the bungalow trailer? That's simple. A second-hand storage battery can be installed in the locker over the mud-guards. This lights the trailer independently of the regular battery in the car. But, when on the road, a cable can be led to the second battery to charge it along with the other battery. Any battery man can fix this hook-up in five minutes.

Of course, a gasoline campstove will be used. This will set on the middle of the rear cabinet. The screened window immediately back of the stove will provide ventilation. Any folding camp table can be set up between the seats, and with

Bungalow Trailer for Auto Campers

a camp chair at each end, accommodation is offered to six people at "eats." But, primarily, this trailer affords comfortable accommodation for four adults. At night, a curtain can be stretched down the middle of the bungalow to offer more privacy.

This bungalow trailer is not designed for merely one season's use. With reasonable care, it will last many seasons. And its saving in hotel bills, camp ground rentals, etc., will soon more than pay the original cost.

If you are an outdoorsman who loves to prowl around in the outback places, this bungalow trailer will give you a world of service and pleasure.

"Tubby"—a 12-Foot Sailing Scow

(Continued from page 145)

While plain iron fastenings are all right for fresh water, it is suggested that galvanized fastenings be used where the boat is to be sailed on salt water.

Use good oil paint for all hull finish and varnish the spars

The total cost of "Tubby," using high grade materials, should not exceed $50, while the boat can be built for $30 by using cheaper grades of lumber. It will be found cheaper in the long run to use the best grade of material.

Below is an itemized list of the materials needed:

It	No. Pcs.	Size	Length
Material—Pine or redwood			
Sides	2	7/8"x15"	12' 0"
Material—Pine			
Bow	1	1¾"x5¾"	4' 0"
Stern	1	7/8"x12"	4' 0"
Stern	1	7/8"x3"	4' 0"
Stern	2	7/8"x3"	0' 9"
Thwart	1	1¾"x5¾"	4' 0"
Bottom Stringers	2	7/8"x3"	14' 0"
Seat Stringers	2	7/8"x3"	12' 0"
Bottom Boards	26	7/8"x5¾"	4' 0"
Seats, Leeboards and Rudder	2	7/8"x12"	14' 0"

Hardware

1 set (2 each) rudder pintle and gudgeons—galvanized.
3 lbs. galvanized boat nails, 2½" long.
1 set oarlocks and sockets.
Screw eyes, blocks, rope, etc., as needed for rig selected.

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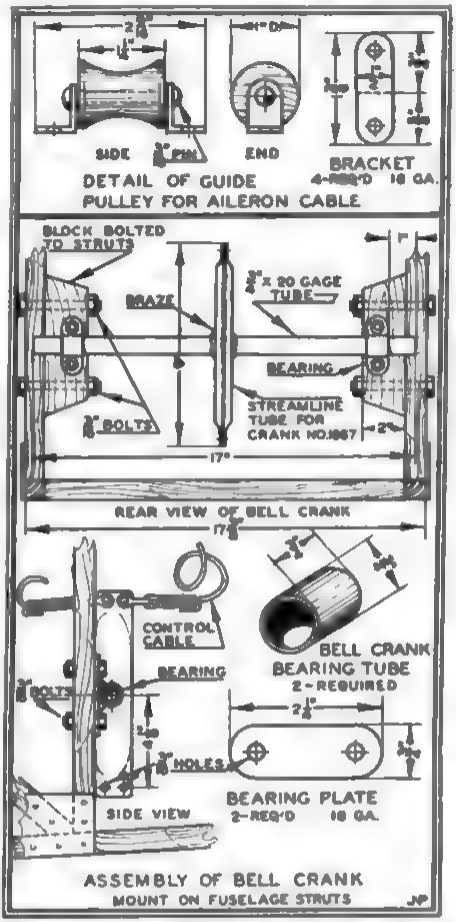
Plans for the Pietenpol Sky Scout

(Continued from page 155)



Here are more working drawings for the control fittings. Dimensions for the construction of the bell crank and guide pulleys for the aileron cables are shown above.

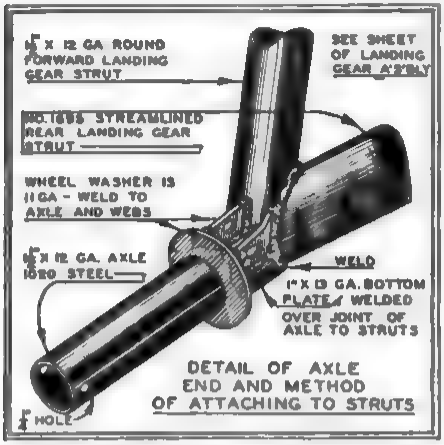
of the things that makes these ships a success.

The first thing to remember in building a low powered ship is to keep the weight down and to keep the efficiency up.

After you have your ship complete, that is, the motor in, tail group on, all controls in, and are ready for the wing, make up your center struts like drawings, (see next month's installment), all brace wires made, get about four extra helpers, put the wing on the center struts and line it up.

Next have some one hold up the ends of the wing so that it will have a little dihedral, and measure the length of the front flying struts. These should both be exactly the same length. When these are in place, do the same with the rear flying struts. Now make the flying or brace wires. Hook up the ailerons, safety all turn-

Plans for the Pietenpol Sky Scout



Here is how the axle end is welded to the landing gear struts. A workmanlike job of welding is vital at this point

buckles and your ship should be ready to go.

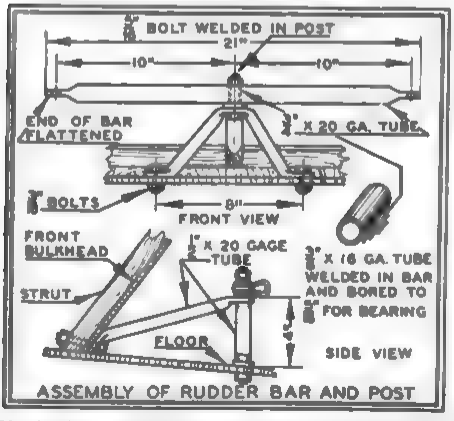
I will likely get a lot of letters saying that I did not cover the whole ship, but if I were to do this it would take more space than this whole magazine.

I personally think that if you cannot build a ship from the plans alone, that all the instructions it would be possible to write would not do you much good.

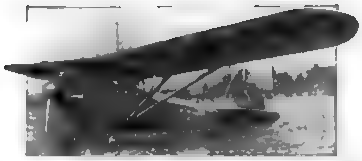
But as I said before, if you know your stuff, you may be able to make improvements in this ship and I would like to hear from those doing it, as it is one of my greatest desires to see the light plane developed into one of the safest and best sports there is.

I believe this to be the safest light plane there is, and if this design is a start in that direction it

(Continued on page 184)



This drawing gives details and dimensions for building and assembling the rudder bar and post. The ends of the rudder bar are flattened and a hole drilled for the cable.



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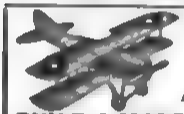

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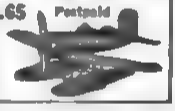

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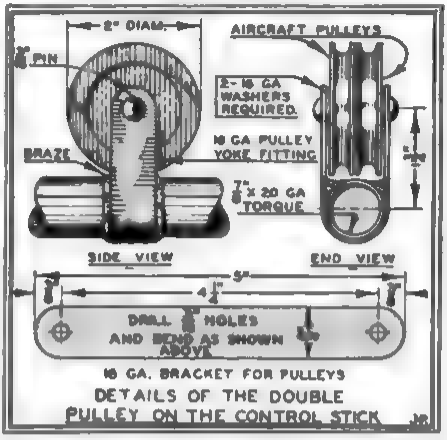
Plans for the Pietenpol Sky Scout

(Continued from page 183)

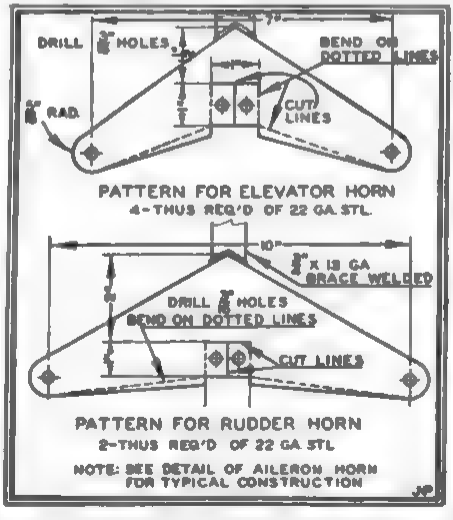


Here is how the pulleys are welded to the control stick torque tube. One pulley is used in front and two at the rear.

has all been well worth the time we have put into it. But those of you who wish only to build so that they will have something to fly had better build it exactly as the plans, and you will be sure of having a ship that is very easy to handle. It is cheap to run and will land and take off at a field where the average OX5 job, or similar powered ship, would be completely out of luck.

I am sure if you ever come to our field and see these ships fly you will agree that these planes will do all we claim they will—and then some.

Next month we will give you drawings for the struts and minor fittings, and will show you how to convert your Model T Ford engine into an efficient aero power plant.



Above are dimensions for elevator and rudder horns. For typical construction see aileron horns in first installment.

Making Trick Motion Pictures

(Continued from page 111)

is taken, and the actors are free to move. Again, the camera is stopped and another object placed on the table, and so on to the end.

Conversely, objects can be removed from a picture by the stop-motion method. You see a child walk behind a large cardboard box, or perhaps crawl into it. Then a truck comes along and flattens out the box, leaving no sign of the child. It's easy if you stop the camera long enough for the child to move out of the picture.

Double-exposure effects, such as photographing a person inside a glass tumbler or flask, are obtained in a manner similar to that employed for the fairy dancing scene. Make the exposure when the main objects are placed in front of a black background. Of course, it is necessary to run the film through the camera two or more times.

Multiple-exposure work requires an accurate film footage meter. Walter Baer, a Pittsburgh photographer, has found that an old alarm clock makes a good meter. He removes all of the works with the exception of the hands and their connecting gearing. To the minute hand shaft he fastens an extension shaft that fits into the key socket of his camera.

By measurement he has found that, for the type of camera he uses (Filmo), a revolution of the hour hand indicates 36 feet of film, one revolution of the minute hand, three feet, and one-half minute equals a single frame on the film.

Action which normally is only moderately interesting on the screen becomes highly absorbing if it is reversed. A cat walking down the porch steps in regular order is not nearly as startling as one that proceeds up or down the steps backwards.

All you have to do to make such pictures is turn your camera upside down! Then, after the film is finished, cut out the section showing the scene, turn it end for end, and cement it in place.

Fancy diving, a man plowing a field, a motor car—in fact, any action that normally proceeds in one direction makes good material for this kind of trick.

If you want something really novel, use two cameras, one mounted upside down, and film the same scene with both of them. Then mount the two versions of the scene in series. On the screen the action will be seen to proceed normally, then suddenly reverse and repeat the same steps backwards.

An attempt has been made to suggest rather than describe how the amateur motion picture camera can be employed for photography other than the uninteresting run-of-mine variety. By exercising your imagination, and studying the unusual photographic effects, you see in motion picture theatres, you can add an endless number of other ideas

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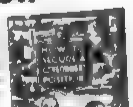

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Perils That Confront City Dwellers

(Continued from page 94)

children at a pleasure resort were suddenly stricken. Some died in agony. At a wedding feast the guests became unconscious.

Chickens, ducks, cats and dogs and pigs gasped and died. Soon it became known that a poison gas was loose. Hundreds rushed in terror from their homes.

Eventually a hissing tank was found, one of many containing deadly phosgene gas, the first kind used for gas attacks in the war. Expansion from warm weather and a corroded top, had caused the gas to escape. Eleven persons died, and many of the 250 sent to hospitals were ill for weeks, some for months.

Numerous cities have had experiences with "peace-time gas attacks." In June, 1929, hydrogen sulphide gas suddenly swept over a part of El Paso, Texas, killing two sleeping children and sending a number of people to the hospital. It probably came from oil refineries nearby.

On the lower east side a chemist's kettle exploded and routed out scores, killing one and injuring a great number.

The Cleveland clinic horror of May 16, 1929, in which 122 hospital patients and rescuers died, was caused by deadly gases from burning X-ray films. An electric light too close to the films probably ignited them. A ventilating system sent the fumes to every room. Health officers reported that the gas released was sufficient to have killed four million people. With a high wind, fog, or other conditions, this might easily have been the greatest disaster of its kind in history. Various cities have had film fires, gas "attacks," and loss of life.

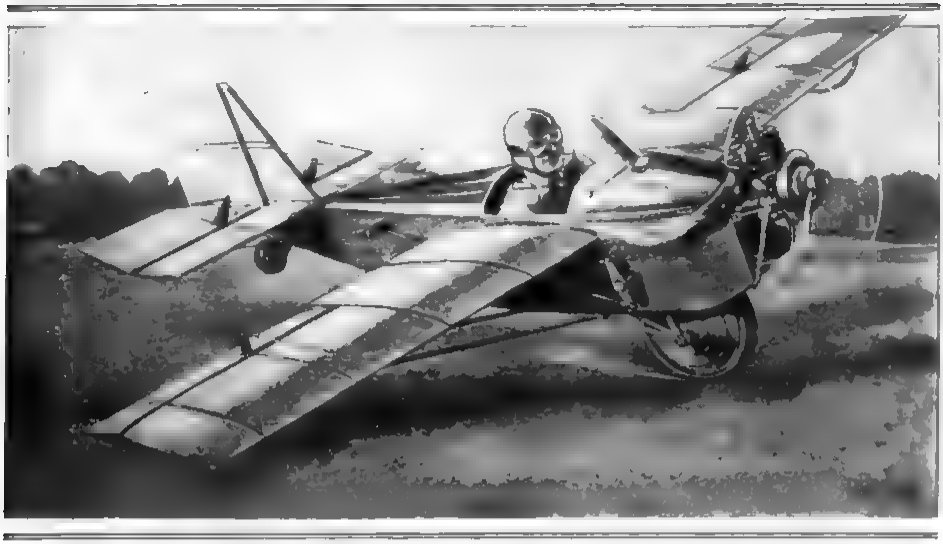
In London, two years ago, over a mile of roadway in the heart of the city was wrecked when gas mains exploded, one after another. Buses and vehicles were upturned, buildings damaged, houses shaken, manhole covers flung far and wide, while clouds of gas and sheets of flame added their terrors to the lurid scene. Water, gas, electric, telephone and other services were wrecked in an area of nearly one square mile.

Explosions in sewers, from sewer gas, gasoline fumes, etc., have been frequent. Terrific blasts in Ottawa sewers, from an unknown cause, blew off manhole covers, sent sheets of flame into basements, and rumbled under the streets for hours, injuring many. In Chicago a similar explosion killed twelve and wrecked a building in a thickly populated area.

In the home there is danger from carbon monoxide, odorless and invisible gas from motorcar exhaust, which may be eliminated by a new carburetor recently invented.

Household refrigerators mostly use harmless gases, and should be in ventilated rooms. Operators of central refrigerating systems in large buildings should use great care.

Safety measures must be taken to protect cities from deadly gases. Electrical detecting and warning devices must be installed—some are already available. Counter-active antidotes and resuscitating devices must be instantly available. Probably we shall require gas-tight, ventilated refuges, such as used in mines, for factories and for homes near chemical plants.



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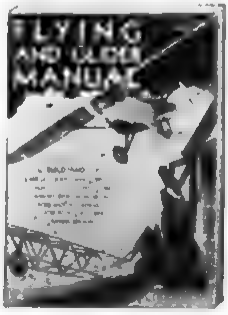

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Miracles of the X-Ray

(Continued from page 75)

peaks where they had set up their device for entrapping electrical potential, a system reminiscent of Benjamin Franklin's experiments in drawing electricity from the clouds with a kite.

In their Berlin workshop these two scientists have built a new type of compact X-ray tube. It is made of rubber, paper and aluminum. It has been tested to 2,600,000 volts, making it a higher potential than any other existing X-ray tube.

It is less than three feet long. Speeding electrons within it drilled holes an inch deep in a brass plate within the tube. The X-rays produced within this tube were able to penetrate a tower of lead a foot thick and still accomplish a photographic film.

This pair of German physicists are not finished yet in their wonderful X-ray work. They are striving for a tube which will produce X-rays of at least 8,000,000 to 16,000,000 volts.

Their laboratory will continue to be the space between the two mountain peaks in the Alps. A hemp rope with 120 insulators has been stretched between these two summits. From this rope they dropped a wire for gathering electricity. They have already discovered and ascertained that this ran to a spark gap which produced fifty-five foot sparks of 16,000,000 volts. Such discharges will be passed through their new X-ray tube when they return to continue their experiments there next summer and fall.

When Mechanical Tricks Go Wrong

(Continued from page 104)

The stage was all set for a trunk trick which I did with my assistant, Harry Anderson, whom I have nicknamed "The Great Alexander." The apparatus consisted of a cabinet, six feet square. This was moved on the stage with a sliding curtain in front of it. A regular standard trunk was placed on a big rug to show that no traps were used. Then I took off my coat and asked someone in the audience to loan me his.

My hands were tied behind me and I was placed in a large bag which was afterwards sealed. Next I was placed in the trunk and after it was locked, chains and ropes were firmly linked around it.

In three seconds I would be loose, rip away the curtains which had been drawn around the trunk by the Great Alexander, and there I would be in my shirtsleeves. The trunk was still bound with the ropes and chains.

That is how I used to do it before that fatal night.

However, at the opening of the "9:15 Revue," the Great Alexander and I exchanged places. We wanted to make a real big hit.

The Great Alexander was bound and bundled into the bag and then placed in the trunk, from which post he was to extricate himself. Instantly I went to the table drawer—which shows how this trick was done—to get the key which would release the trunk. It was gone!

My mind worked like fury. I couldn't imagine what was wrong. The Great Alexander's life was in peril. I dashed to my dressing-room while the audience suspected nothing. Fortunately, I found a duplicate key there.

When Mechanical Tricks Go Wrong

In the end I got the Great Alexander out of his bondage. That trunk might easily have proved his sarcophagus with another moment's delay. And I'm not the kind of a magician who can do much for a fellow after he gets into a coffin in a serious way.

Curious to learn what had gone awry, I asked the Great Alexander about it.

"Well, I'll tell you," he replied, still shaking, "you see I got so excited about doing the important part of this trick that I forgot to put the key in the drawer. I kept it in my pocket."

Perhaps some of the most distressing embarrassment I have suffered came with the folding-up prematurely of Broadway night clubs and musical comedy shows, without getting my full salary after starring in them. The sheriff always seemed to have it in for any show I was in. Getting out of these embarrassing situations has given me the greatest thrills of my life.

Build a Little House Within a House

(Continued from page 171)

have complete bungalow service on the first floor.

Notice the service unit, the bathroom and kitchen are next to one another. This means economy in plumbing installation. The front entrance serves both owner and tenant. It leads directly to the kitchen, living room and apartment.

The living room, 20 by 13 feet, opens by French doors onto a semi-enclosed porch. This porch may be used for summertime living purposes, or, if glazed, would be an all-weather room. A fireplace is a feature of the living room.

Entrance to the garage is through a door leading from the porch. While the garage is a one-car affair it can be easily enlarged to accommodate two cars. This might be desirable, inasmuch as a tenant would no doubt own a car and there would be added cash income from garage rent.

The kitchen is compact and planned to save steps and labor. It is equipped with cabinets and all details to delight the taste of the most particular housewife.

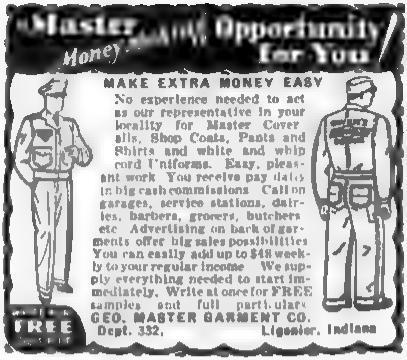
The house is frame construction with weather boarding or clapboards over 8" sheathing. The roof may be either edge grain red cedar shingles or asbestos. There is a full basement with laundry and furnace rooms and vegetable cellar.

To relieve the monotony of detail stucco has been used high up and across the front of the house, also under the porch at the rear. Stock details are used throughout, which means a considerable saving.

Blinds trim the windows and a simple but ornamental entrance door complete the exterior finish. Painted white with green blinds and set within a velvety green lawn, the house will appear larger and more costly than it really is. This is an important point if you have at least one eye on resale value.

The designer says $6000 is a close price range under present day conditions. Perhaps more and maybe less, depending upon where and how you build. By omitting the one-room apartment there will be $500 saved.

Taken altogether the house is in line with modern trends. It's an income producer.



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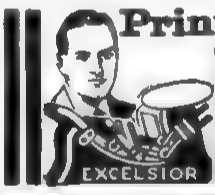

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Fortune Making Ideas for Inventors

(Continued from page 99)

bottle to one's lips and, presto! the correct amount is swallowed.

Specifications: Should be made either of pressed metal or some sort of cheap molded compound. It should not cost over two cents to make and should also perform the function of taking the place of the cork.

As a substitute for this sort of thing, a measuring device might be perfected that could be sold for a higher price and simply placed in bottles as they are purchased.

In this event the device should have a retail price not to exceed twenty-five cents.

Exploitation: Should be patented in all countries and should be licensed to manufacturers of patent medicine. A royalty of a quarter of a cent a bottle should be asked.

2. Vacuum Pump to Clean Sinks

Here is a neat little problem. We are all familiar with the rubber suction caps used to clean sink traps when they get stubborn and plugged up.

These gadgets do not always work because they leak air and do not produce a powerful enough vacuum to lift the water and dislodge the clogged matter.

Why not a portable electrical vacuum pump that could be carried by plumbers that would produce a powerful enough vacuum to dislodge the matter in plugged pipes that cannot be dislodged by ordinary means?

Such a device would save a great deal of money in time and labor and it would be a most profitable tool for those who bought it.

Specifications: Should be built to sell for about $35.00 and should be of a minimum weight.

Exploitation: Should be sold outright to some manufacturer of plumbing supplies for $10,000.

3. Real Need for Non-Slipping Tripod

Photographers have been using crude tripods for years and yet no inventor has taken time to provide them with something that would insure the camera, often very expensive, from crashing to the floor as often happens. A two or three hundred dollar lens may go in one crash.

Although this would appear to be a rather simple problem, it is still a problem and I hope that one of my ingenious readers will extend a hand to suffering photographers and at the same time enrich himself to the extent of a few thousand dollars.

Specifications: It should not add over fifty per cent to the cost of a good tripod and it should not add over twenty-five per cent either to weight or bulk.

Of course, the ideal solution would be a device that would add neither weight nor bulk. It should also not interfere with the adjustable features and should leave tripods just as flexible as to positions that they may assume as they are now.

Exploitation: Should be patented in the principal countries of the world and should be sold on an outright basis for say, $15,000.

4. Solenoid Windshield Wiper

The motor-driven electrical windshield wiper has had a rather questionable success. A solenoid used to drive a wiper would be far more simple,

more reliable and it would cost less to make.

By a solenoid I refer merely to a coil of wire hollow in the center so that an iron core may be drawn in and out when the current is applied.

I have an idea that a good wiper could be built on this principle that would cost about one-third of the present cost of wipers and that it would be far more satisfactory. At least I am going to leave this problem in the hands of my readers.

As a matter of fact, if I can depend upon past experience, I shall wager that a successful patent will be put through by one of the gang within the next three months.

Exploitation: Should be patented in this country. It should be sold outright to some large manufacturer of auto accessories. I think a successful solution to this matter should easily be worth $40,000 on an outright sale.

5. *Wanted: A Wind-Proof Awning*

The world has been waiting for an awning that will be wind-proof.

When I lived in New York City, we were constantly troubled with the awning problem. It was necessary to lift the awnings when the apartment was left alone for fear of a sudden windstorm. One day they were neglected through a rush to keep an appointment and the unexpected windstorm arrived. When we returned to the apartment we had no awnings and in two instances, no window panes.

Why not an awning arranged with a counterweight and a vane so that when the wind pressure against the vane reached a certain critical point the counterweight would be released and the awning would be closed?

This appears like a sensible solution to a bad problem and I am going to leave it to my readers to work out the details.

Specifications: Device should be simple and should always function. It should not add any more than a dollar to the cost of an awning.

Exploitation: Should be patented in this country and all countries where protection from sunlight is necessary. Should be sold outright for $25,000.

6. *Door Bell to Save Confusion*

Do you have the same kind of a front and rear door bell in your house? Are you always trying to guess whether the party is at the front or back door?

Of course, I am willing to admit that many homes have two different bells with different rings but that does not exactly solve the problem I have in mind. In fact, I might take this as point to illustrate it.

Why not develop a bell that will have two gongs and one ringing mechanism? In other words a front and rear door bell combination; all in one unit but with different rings.

Exploitation: Should be patented in all of the civilized countries of the world and should be sold outright to the principal electrical manufacturers of the various countries in which it is patented. A small royalty may be demanded—say a penny a bell—if the inventor decides to exploit his device in this manner. World rights should not be sold for less than fifty thousand dollars

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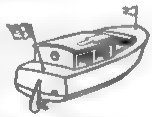

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